CERAMIC ABSTRACTS and THE BULLETIN

AMERICAN CERAMIC SOCIETY

OCTOBER 15, 1942

MONTHLY PUBLICATION DEVOTED TO THE ARTS AND SCIENCES RELATED TO THE SILICATE INDUSTRIES

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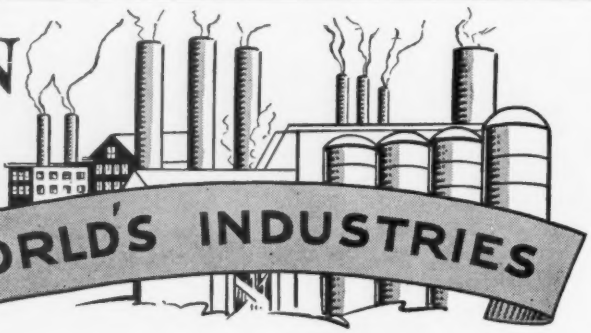

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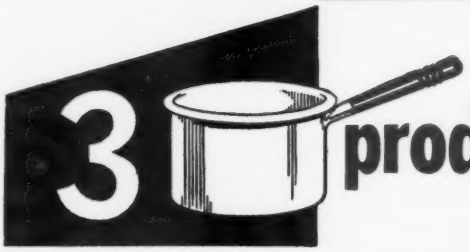

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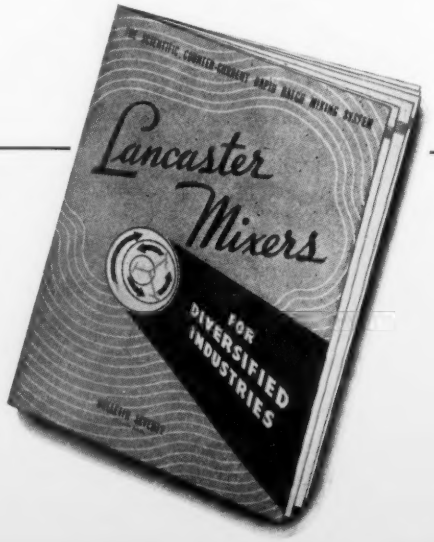

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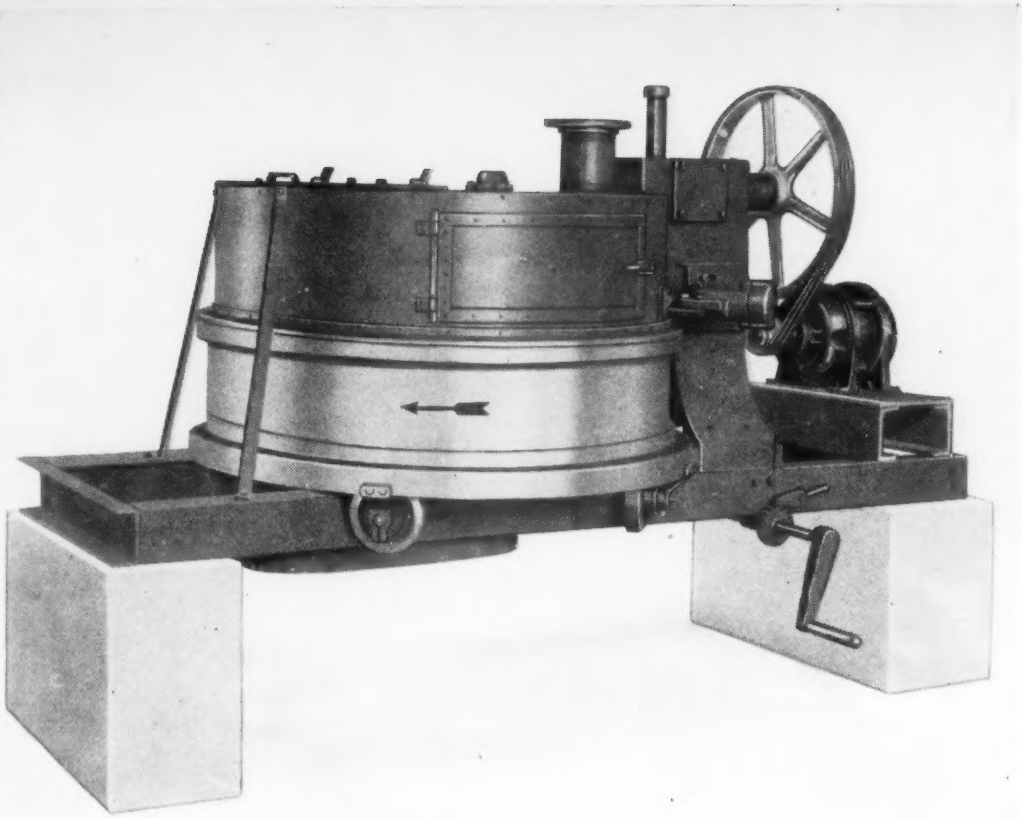

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* In Editorial Section

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2 **Inspect idle equipment. If it can't be used, *scrap it.***

3 **Set up a plant clean-up day for *every* week. Collect *everything* that is not useful.**

4 **Separate the scrap—ferrous and non-ferrous metals, for example. Then call the scrap dealer. (Steel scrap collected will be purchased by the steel industry at prices set by the Government.)**

5 **On plant bulletin boards urge your employees to search their homes and garages for old rubber articles, rags and discarded metal household equipment. Ask them to take their scrap to the nearest collection point—or call the local Salvage Committee.**

• • •

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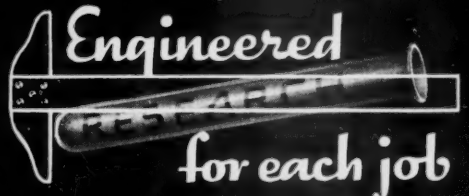

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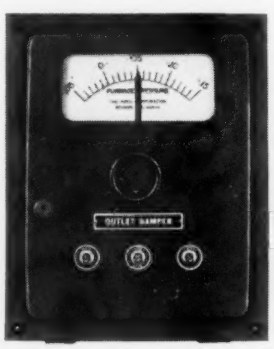

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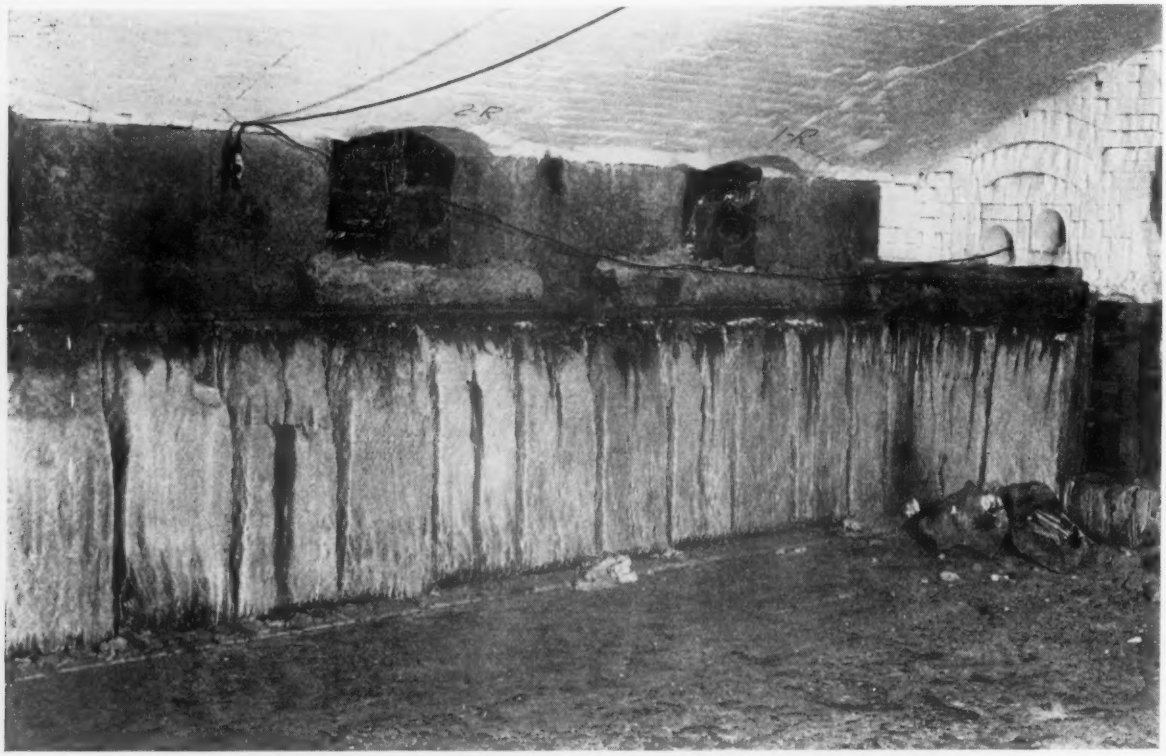

Corhart* Electrocast Tank Produces 122,200 Tons!

BACK IN November, 1937 we published the figures for a "record-breaking" Corhart* Electrocast tank which had produced 76,446 tons of soda-lime glass, in 556 operating days. At that time we said "When the furnace was let out (on a date set more than a year previously) the tank operators found that they could have run this record-breaking furnance for possibly another 12 months without predictable danger of failure".

Now this same tank has just finished another campaign, in which it actually did run "another twelve months"— or a total of over 36 months! During this three year period, it produced 122,200 tons of soda-lime glass.

The operating figures shown below are for that first run, for the last run, and also for an intermediate campaign in 1937-39. We believe these figures will interest every glass manufacturer who is concerned with producing *more glass* at *less cost!*

Corhart Refractories Company, Incorporated, Sixteenth & Lee Streets, Louisville, Ky.

*Not a product, but a trade-mark.

	CAMPAIGN 1935-1937	CAMPAIGN 1937-1939	CAMPAIGN 1939-1942
Total Days of Life	708	710	1,100
Total Operating Days	556	456	835
Square Feet Melting Area	1,000	1,000	1,000
Total Glass Delivered (Tons)	76,446	62,638	122,200
Tons of Glass Melted Per Day (based on total life)	107.9	88.2	111.0
Tons of Glass Melted Per Day (based on operating days)	137.4	137.3	146.3
Square Feet Melting Area Per Ton of Glass (based on total life)	9.2	11.3	9.0
Square Feet Melting Area Per Ton of Glass (based on operating days)	7.2	7.2	6.8
Tons of Glass Per Square Foot of Melting Area Per Life of Tank	76.4	62.6	122.2

QUALITY ECONOMY ENDURANCE

CORHART
ELECTROCAST
REFRACTORIES

CERAMIC ABSTRACTS

Compiled by

THE AMERICAN CERAMIC SOCIETY

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Vol. 21 **October 15, 1942** **No. 10**

Abrasives

Grinding of cemented carbide tools. A. J. SCHROEDER. *Metallurgia*, **26** [153] 88–90 (1942).—Because of their type of structure and great hardness, cemented carbide tools must be ground by methods different from those used in grinding cast carbides. Special attention must be given to the grinding agent. See *Ceram. Abs.*, **21** [9] 181 (1942). E.C.P.

Shaping of simple grinding wheels for threads. F. KRÜKER. *Werkstattstechnik*, **34** [20] 342–48 (1940); abstracted in *Physik. Ber.*, **22** [3] 266 (1941).—K. describes the different parts of a grinding wheel and their relation to each other. Examples for the design of wheels for different thread profiles are given. M.HA.

PATENTS

Abrasive article. E. E. NOVOTNY AND J. N. KUZMICK (Durite Plastics, Inc., and Raybestos-Manhattan, Inc.). U. S. 2,294,239, Aug. 25, 1942 (April 9, 1938).—An abrasive composition comprising abrasive grains, a potentially reactive phenolic resin, and a reactive magnesium oxide in finely comminuted form.

Abrasive disk and method of making. F. O. ALBERTSON (Albertson & Co., Inc.). U. S. 2,292,261, Aug. 4, 1942 (Feb. 19, 1940).

Apparatus for grinding parallel circumferential grooves. W. H. NEWMAN. Brit. 546,316, July 22, 1942 (April 29, 1941).

Apparatus for sharpening skates. PHILIP BRUNO. U. S. 2,294,715, Sept. 1, 1942 (March 16, 1942).

Apparatus for wheel dressing. J. C. WILSON (Thompson Grinder Co.). U. S. 2,294,493, Sept. 1, 1942 (Aug. 28, 1940).

Automatic infeeding mechanism for grinding machines. R. D. WORTENDYKE AND A. J. GRAF (Cincinnati Grinders, Inc.). U. S. 2,294,265, Aug. 25, 1942 (Aug. 4, 1941).

Centerless grinder. PETER STEWART AND J. H. SWIFT (American Steel & Wire Co.). U. S. 2,293,923, Aug. 25, 1942 (Sept. 7, 1939).

Device for dressing profiled grinding wheels. FERNAND TURRETTINI (Soc. Genevoise d'Instruments de Physique). U. S. 2,294,008, Aug. 25, 1942 (June 15, 1940).

Dresser attachment for grinding machines. J. C. WILSON (Thompson Grinder Co.). U. S. 2,294,492, Sept. 1, 1942 (Aug. 28, 1940).

Edge-grinding machine. N. H. KLAGES (G. W. Klages & Son). U. S. 2,293,828, Aug. 25, 1942 (July 8, 1941). U. S. 2,293,829, Aug. 25, 1942 (Feb. 25, 1942).

Flexible abrasive product. GEORGE CROMPTON, JR. (Behr-Manning Corp.). U. S. 2,292,991, Aug. 11, 1942 (March 6, 1941).

Gear-grinding machine. A. H. ORCUTT (Gear Grinding Co., Ltd.). U. S. 2,294,045, Aug. 25, 1942 (July 12, 1940).

Grinder. J. W. RESIDE. U. S. 2,293,216, Aug. 18, 1942 (July 14, 1941).—A grinding machine for finishing off the inner edges of annular plates.

Grinder for grinding pressure bars of veneer-cutting machines. C. A. BLOMEEN. U. S. 2,293,103, Aug. 18, 1942 (March 24, 1941).

Grinding machine. M. H. ARMS AND ALBERT TURNER (Bryant Chucking Grinder Co.). U. S. 2,293,327, Aug. 18, 1942 (Dec. 22, 1939). S. G. BRADY (Gear Grinding Machine Co.). U. S. 2,294,733, Sept. 1, 1942 (March 3, 1941). W. H. WOOD (Norton Co.). U. S. 2,294,872, Sept. 1, 1942 (Oct. 26, 1940).

Grinding-wheel dresser. J. C. WILSON (Thompson Grinder Co.). U. S. 2,294,494, Sept. 1, 1942 (Aug. 28, 1940).

Grinding-wheel speed control. C. C. ALVORD (Norton Co.). U. S. 2,294,153, Aug. 25, 1942 (Oct. 23, 1941).

Grinding wheel truing apparatus. L. A. KASPARSON AND J. I. GARSIDE (Norton Co.). U. S. 2,292,947, Aug. 11, 1942 (July 23, 1941).

Honing machine. A. M. JOHNSON (Barnes Drill Co.). U. S. 2,294,184, Aug. 25, 1942 (Feb. 28, 1940).

Internal thread grinding machine. R. E. FLANDERS (Jones & Lamson Machine Co.). U. S. 2,292,875, Aug. 11, 1942 (Feb. 8, 1941).

Machines having reciprocating slides for grinding screw threads, etc. H. F. ATKINS. Brit. 545,998, July 8, 1942 (Dec. 20, 1940).

Making ceramic-bonded articles. J. F. BARNES, W. F. PARSONS, AND GARRET VAN NIMWEGEN (Carborundum Co.). U. S. 2,293,099, Aug. 18, 1942 (Feb. 24, 1939).—The method of making an abrasive article which comprises mixing fused-alumina grain with a ceramic bond amounting to less than 10% of the aluminous grain, wetting the grain and bond with a stabilizer for rubber latex, incorporating in the mixture rubber latex along with a

material which becomes a coagulator on heating, pouring the mix into a mold, vibrating the mold and its contents, adding additional delayed coagulating material on top of the mix, heating the mold and its contents, drying the coagulated mix, and firing the molded and dried article to temperatures high enough to remove the organic constituents and to unite the ceramic bond to the abrasive particles.

Means for grinding surfaces. A. HERBERT, LTD., AND A. H. LLOYD. Brit. 546,450, July 29, 1942 (July 9, 1941).

Power knock-off devices for grinding machines or other machine tools. BROWN & SHARPE MFG. CO. Brit. 546,355, July 22, 1942 (March 14, 1940).

Saw grinder. T. C. ANDRIANOFF (Armstrong Mfg. Co.). U. S. 2,292,595, Aug. 11, 1942 (Nov. 29, 1940).

Splash guard for grinding machines. E. C. KRUEGER (Hammond Machinery Builders, Inc.). U. S. 2,292,229, Aug. 4, 1942 (April 6, 1942).

Tire abrading or buffing machine. R. R. POLLOCK. U. S. 2,294,047, Aug. 25, 1942 (Sept. 11, 1940).

Valve-lapping machine. C. J. JOHNSON (Reed Roller Bit Co.). U. S. 2,293,651, Aug. 18, 1942 (Dec. 24, 1940).

Vitrified abrasive wheel. C. E. HITE. U. S. 2,292,758, Aug. 11, 1942 (June 25, 1940).—A mix for a vitrified abrasive form comprising grain, feldspar, and Portland cement.

Wheel-truing mechanism. R. E. FLANDERS (Jones & Lamson Machine Co.). U. S. 2,292,874, Aug. 11, 1942 (April 4, 1940).

Art and Archeology

Antique glass. C. F. KELLEY. *Bull. Art Inst. Chicago,* **36** [3] 79–80 (1940).—The Robinson collection of ancient glass is on display as an indefinite loan in its own gallery at the Institute. The majority of the pieces, "as iridescent as a butterfly's wing," were once regarded as merely matter-of-fact objects for daily use, produced at slight expense and made of the commonest materials. Originally they were not fragile and were not thought beautiful in color; for the most part, they were a faint green and were transparent. Long buried in the earth with their owners, they underwent a progressive chemical decomposition which resulted in most of the pieces becoming brilliantly iridescent. The earliest glass shown comes from Egypt where glass manufacture possibly originated. None of the Robinson pieces can be dated before the 18th dynasty, the period of Rameses II, the Pharaoh of the Scriptures. Tedious methods of glass manufacture prevailed up to the 1st century B.C., when the discovery of glass blowing produced an economic revolution in the industry. K.R.

Ceramic art in Cincinnati. ANON. *Ceram. Age,* **39** [4] 112–18 (1942).—Art schools, museums, and ceramic plants of Cincinnati are briefly described and illustrated. F.G.H.

China trade influences in ceramic art at Metropolitan Museum of Art. ANON. *Ceram. Age,* **38** [6] 173 (1941).—A page of illustrations is presented. See *Ceram. Abs.,* **21** [3] 56 (1942). F.G.H.

Functional design. C. M. HARDER. *Bull. Amer. Ceram. Soc.,* **21** [8] 174–76 (1942).

Half a thousand years of pottery in Waldenburg, Saxony. ALBERT SCHRÖDER. *Keram. Rundschau,* **46** [40] 469–70 (1938).—The stoneware of Waldenburg, perhaps the oldest in Germany, flourished from the 15th to the 17th century. Only fragments of stoneware from before that time are in existence; these are insufficient to give much information regarding the earliest ware. The high quality of the stoneware now preserved in museums is due to the excellent clay found in the region. Jugs and pitchers of different shapes, decorated with relief medallions, coats of arms, etc., are pictured. The green copper glaze and pyrolusite black coloring of the ornamental tile stoves also produced give evidence of the technical knowledge of the potters of that period. See "Masterpieces...," *Ceram. Abs.,* **21** [7] 139 (1942). M.V.C.

Isaac Watts Knowles. LUCILLE T. COX. *Bull. Amer. Ceram. Soc.,* **21** [8] 152–57 (1942).—2 references, 4 photographs.

New process developed for decalcomania production. ANON. *Ceram. Age,* **39** [1] 18–19 (1942).—In a new process for making chinaware decalcomanias, photolithography is substituted for hand lithography in preparing plates from which decals are printed. Illustrated. F.G.H.

Pennsylvania German pottery. I. S. STAHL. *Ceram. Age,* **38** [3] 69–71 (1941).—S. gives a brief historical review covering Pennsylvania German pottery and the Stahl family of potters. Illustrated. See *Ceram. Abs.,* **21** [9] 182 (1942); *Bull. Amer. Ceram. Soc.,* **19** [1] 22–24 (1940). F.G.H.

Problems of dinnerware design. EVA S. ZEISEL. *Ceram. Age,* **40** [1] 7–10 (1942).—Z. discusses dinnerware design from the following standpoints: (1) attractiveness, (2) ease of handling with minimum motion, and (3) ease of cleansing. Illustrated. F.G.H.

Rare Chinese bowl. C. F. KELLEY. *Bull. Art Inst. Chicago,* **35** [5] 70–71 (1941).—The Art Institute of Chicago has received as a gift a Chinese porcelain bowl. The bowl is so thin that one Chinese term applied to it means "bodiless." Its glaze is described as being practically nonexistent. It survived the trip overseas in May, 1940, escaping the London bombings, and arrived in Chicago intact. It was made in the 15th century for Jung Lo, a Ming emperor, whose capital, Nanking, was not far from the great Chinese ceramic center which still manufactures porcelain. The bowl is white but appears a greenish-yellow by transmitted light; its so-called "secret" decoration can be made out only by this light. The intricate design was painted in a clay slip using the same material as that forming the body of the ware. The design, which includes several dragons playing with a jewel, is in slight relief; it is obscured still further by a surface coat of colorless glaze and can be seen only by the use of light. An almost exact counterpart of this bowl is in the British Museum. The bowl has a diameter of $8^5/_8$ in. at the top and $2^5/_8$ in. at the base; its total height is $2^5/_8$ in. Sometimes, in the intense heat of firing (about 1500°C.), particles detached themselves from the thin walls and dropped to the surface of the liquefying glaze. They were considered to be distinguishing characteristics of the period of manufacture. K.R.

Reinstallation of the Oriental galleries. C. F. KELLEY. *Bull. Art Inst. Chicago,* **36** [3] 90–91 (1940).—New arrangements of the extensive Oriental possessions of the Art Institute have brought into prominence Chinese ceramics from the 4th to the 14th centuries, including T'ang figurines, glazed and unglazed, superb examples of Han pottery, a group of ceramic ware of the six dynasties, and excellent examples of Yüeh ware. K.R.

BOOK

Color Harmony Manual. Color Laboratories Division, Container Corp. of America, 111 W. Washington Blvd., Chicago, Ill., 1942. Price $50.—The manual consists of 12 book charts and one textbook, by Egbert Jacobson, illustrated with diagrams. The charts contain 680 movable color chips based on the Ostwald theory. The colors were developed by Carl E. Foss from colorimetric specifications in accordance with standard procedures through the use of spectrophotometric measurements. The chips were prepared by applying a pigmented film of appropriate color to a base of clear transparent cellulose acetate. This provides a color standard with a dull surface on the side of the coating and a glossy surface on the other side, a decided advantage in comparing flat colors with inks or wet paint samples. Pigments of maximum permanence were used in a vehicle composed of cellulose acetate to keep color change with time at a minimum. The manual is an

indispensable reference for any kind of color matching in paint and ceramics.

PATENT

Design for plate. T. W. OBERT (Iroquois China Co.). U. S. 133,362, Aug. 11, 1942 (May 14, 1942).

Cements

Aluminates of calcium. THORBERGUR THORVALDSON. *Can. Chem. & Process Industries*, **26** [3] 172–74 (1942).—When pure tricalcium aluminate was hydrated in water at a temperature just above 0°C., a crystalline product composed entirely of hexagonal plates was formed. After being stored at 21°C. over salt solution giving 98% humidity, the hydrate had the composition $3CaO \cdot Al_2O_3 \cdot 12H_2O$. When the aluminate was hydrated at room temperature in a large excess of water, a mixture of plates, needles, and spherulites was formed. When the aluminate was hydrated in saturated steam at 150° to 170°C., a gel-like material having a refractive index of 1.604 and 40% water at constant weight was formed. The X-ray powder pattern showed that this material was crystalline, belonging to the cubic system. The aluminate may be hydrated directly to form an isotropic hexahydrate. Steam curing of precast concrete greatly increases its resistance to sulfate disintegration. The reason for this is being sought.

B.L.

Carbonation of aluminate solutions with an increase in the alkali content and the nature of the alkali in the hydrated alumina. F. N. STROKOV, A. L. KOSTRAK, AND R. V. PROKOF'EVA. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940,** No. 32, pp. 166–79; *Khim. Referat. Zhur.*, **4** [2] 84 (1941).—The factors affecting the physicochemical properties of $Al(OH)_3$, separated by carbonizing alumina solutions, are the temperature of the solution during carbonation, the duration of the process, and the intensity of mixing. Carbonizing at 80° without agitation produces a hydrate containing an appreciable amount of alkali. Stirring at a rate of 60 to 100 r.p.m. yielded a hydrate containing up to 0.5% (of Al_2O_3) of alkali in 16 to 18 hr. Increasing the speed to 300 r.p.m. yields 0.65% of alkali in 4 hr. The alkali in the hydrate is of three kinds: (1) adhering alkali, removable by boiling with water; (2) the alkali forming a part of the aluminosilicate; and (3) alkali in the intercrystalline liquid. M.Ho.

Cement for insulators. K. M. DOMNICH AND M. I. ABRAMOVA. *Vestnik Elektroprom.*, **10** [1] 31–34 (1939); abstracted in *Physik. Ber.*, **22** [6] 676–77 (1941).—The cement consists of a gypsum cement (gypsum calcined at 900°C., ground, and mixed with 0.6% $NaHSO_4$ + 0.8 $CuSO_4$) and is made up with a salt solution of 44 gm. per liter $(NH_4)_2SO_4$ + 220 gm. per liter $Al_2(SO_4)_3$ or 300 gm. per liter ammonium alum. The finished cement should contain 2% CaO or less and should have a tensile strength equal to or greater than 15 kgm. per cm.², an increase in volume on setting of 0.7 to 1.6%, a setting time of 25 to 90 min., and an alum consumption of 45 mgm. per 100 gm. cement. The use of potassium instead of ammonium alum reduces the tensile strength 40%. The addition of sand, 100 parts per 100 parts gypsum cement and 45 mgm. ammonium alum, improves the properties at high temperatures by reducing the water evaporation and thus delaying the formation of cracks. Operating experiences confirmed the usefulness of this cement for insulators which do not come in contact with transformer oil.

M.HA.

Chemical reactions encountered in leaching nepheline-lime calcines. F. N. STROKOV. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940,** No. 32, pp. 115–28; *Khim. Referat. Zhur.*, **4** [2] 83 (1941).—The chemical reactions occurring during the leaching of nepheline-lime calcines are analyzed. The conditions necessary for leaching and obtaining a solution of aluminates were determined. It is necessary to separate the solution from the sludge and wash it rapidly. Extended contact of the sludge with the solution containing SiO_2 is conducive to secondary reactions with a resulting loss of Al_2O_3.

M.HO.

Compounds formed in the system R_2O–CaO–SiO_2 through calcination and their behavior upon hydrochemical treatment. F. N. STROKOV, V. A. MUSIAKOV, AND E. YA. ITKINA. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940,** No. 32, pp. 54–63; *Khim. Referat. Zhur.*, **4** [2] 81 (1941).—The calcination of Na_2O (K_2O), CaO, and SiO_2 at 1000° in any stoichiometric proportions forms a triple compound of the type $nR_2O \cdot mCaO \cdot pSiO_2$. An excess of soda in a nepheline batch over and above the stoichiometric quantity required for the formation of a Na or K aluminate and to replenish the losses of alkali during the calcination process results in the formation of triple compounds insoluble in water and in leaching solutions and a corresponding loss of soda. In triple compounds containing more than 1 mole of R_2O, only 4 to 25% of it is leached out. By leaching $2Na_2O \cdot CaO \cdot 3SiO_2$ for 30 min. at 70°, 25% of the Na_2O was extracted. M.HO.

Leaching a nepheline calcine by a spray method and the most favorable conditions for obtaining a nepheline calcine. I. S. LILEEV, YA. M. PESIN, V. M. FRIDMAN, AND K. I. KHRENNIKOV. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940,** No. 32, pp. 134–47; *Khim. Referat. Zhur.*, **4** [2] 83–84 (1941).—A loss of at least 20% of Al_2O_3 was observed in leaching a nepheline-lime calcine. This loss is mainly the result of the contact of the aluminate solution and the sludge, causing the formation of aluminosilicates. A method is suggested which reduces the loss to 14%. By this method, the mixture is made to contain 2.1 moles of $CaCO_3$ per mole of SiO_2 and 0.1 mole of Na_2CO_3 per mole of Al_2O_3; the mixture is then calcined at 1200° to 1280°. The calcine is ground and leached by spraying at 50° to 70° with a solution of 1 mole Na_2CO_3 per mole of Al_2O_3 in the calcine. The soda is added to the third wash water.

M.HO.

Magnesium oxychloride sparkproof floors. MAX Y. SEATON. *Chem. Industries*, **51** [1] 74–77 (1942).—An industrial floor which is sparkproof, resilient, resistant to the abrasive action of factory trucks, and water resistant is described. It is a two-layer floor in which the undercoat contains highly resilient fillers and the top coat hard fillers, none of which would produce sparks from striking or abrasive action. The ability to prevent the build-up of static electricity has been achieved by a grid composed of right-angled brass strips fastened to the upper surface of the undercoat. A sparkproof flooring should not show any sparks when tested by a high-speed grinding wheel having a small iron chain and a stiff iron wheel and rotating at not less than 1000 r.p.m. Tentative specifications for sparkproof plastic composition flooring are included. E.D.M.

Nature of aluminate solutions as related to their physical constants and their dialysis. F. N. STROKOV, V. A. MUSIAKOV, R. I. MELAMED, AND R. V. PROKOF'EVA. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940,** No. 32, pp. 95–114; [2] 82–83 (1941).—The specific gravity, adhesion, and electrical conductivity of aluminate solutions obtained by leaching a nepheline-lime calcine, a bauxite calcine, solutions of synthetic aluminates, and solutions of the electrolytes Na_2CO_3 and NaOH and their mixture were investigated. A complete correlation was found between the physical constants and the concentration and alkali modulus. Exceptions to this were the aluminate solutions with an alkali modulus approaching 3. In these, a break was observed in the continuity of the function of specific gravity and adhesion and in the electrical conductivity curve. The deviations are not caused by any colloidal processes. From these observations, it can be concluded that solutions of aluminates are of the ionic type. This was confirmed by observations with an ultramicroscope which showed that freshly prepared aluminate solutions are optically clear. When the

solution commences to decompose, ultramicrons appear at first; these gradually grow into microparticles and then into macroparticles of crystalline $Al(OH)_3$ which ultimately settle out. Dialysis of the aluminate solutions shows that Al_2O_3 as well as the other components (NaOH and Na_2CO_3) pass through a colloidal diaphragm. The solid phase consists essentially of crystalline $Al_2O_3 \cdot 3H_2O$ (hydrogillite) and a small amount of an amorphous phase of undetermined structure. M.Ho.

Nature of the isotropic phase in a nepheline-lime calcine. F. N. Strokov. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940**, No. 32, pp. 82–86; *Khim. Referat. Zhur.*, **4** [2] 82 (1941).—A nepheline-lime mixture calcined at 1300° has a comparatively simple mineralogical composition. It consists essentially of β-$2CaO \cdot SiO_2$ and an isotropic phase. The latter is a solid solution of β-$2CaO \cdot SiO_2$ in alkali aluminate to the amount of 30% of the aluminate. The isotropic phase can be synthesized by mixing 30% of CaO and SiO_2 (in the ratio of 2 CaO : SiO_2) with the aluminate, adding approximately 1% of Fe_2O_3, and calcining the mix at 1300°. When the synthesized isotropic phase is leached with NaOH (0.5 mole of Na_2O for 1 mole of Al_2O_3) at 75° for 30 min., the Al_2O_3 extracted amounts to 97.2%. When the calcine is leached with a mixture of Na_2CO_3 and NaOH (0.3 mole of Na_2CO_3 and 0.2 mole of Na_2O for 1 mole of Al_2O_3), the yield of Al_2O_3 is only 74%. When the synthetic isotropic phase is mixed with β-$2CaO \cdot SiO_2$ in the ratio in which they are present in a lime-nepheline calcine and subsequently leached with a mixture of Na_2CO_3 and NaOH, the yield of Al_2O_3 is 93.7%. Apparently, β-$2CaO \cdot SiO_2$ causticizes the Na_2CO_3, thereby increasing the causticity of the leaching solution with a resulting increase in the yield of Al_2O_3. M.Ho.

Nomograph for computing compound compositions of Portland cements. Benjamin Janer. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 550–51 (1942).—Construction departments of government agencies, federal, state, and municipal, are showing an increasing tendency to specify Portland cements on the basis of the computed compound composition. The latest revision of the specifications for Portland cement of the American Society for Testing Materials reflects this trend. The nomographic chart submitted simplifies considerably the necessary computations from the oxide analyses. F.G.H.

Relation between the yield of alumina from nepheline-lime calcines obtained by leaching and their porosity and degree of grinding. F. N. Strokov. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940**, No. 32, pp. 128–34; *Khim. Referat. Zhur.*, **4** [2] 83 (1941).—S. investigated the extraction of Al_2O_3 from calcines having a porosity of 7.21 and 50%, ground to 3-, 50-, and 170-mesh. The leaching solution contained 0.5 to 2 moles of R_2CO_3 and of R_2O per mole of Al_2O_3. Calcines having a porosity of 21%, ground to 3-mesh and leached with a solution of 0.5 mole R_2CO_3 per mole of Al_2O_3, gave 53% Al_2O_3; material ground to 50-mesh yielded 85%; grinding to finer than 70-mesh had practically no effect on the yield of Al_2O_3. For material ground through 50-mesh, the yield of Al_2O_3 was practically the same for porosities of 7 to 50%. The degree of grinding at 50% porosity does not materially affect the yield of Al_2O_3. The grinding of material with 50% porosity to finer than 50-mesh diminishes the yield. Increasing the R_2CO_3 in the leaching solution from 0.5 to 1.25 moles per mole of Al_2O_3 increases the yield of the latter 3 to 4%. Further increases of R_2CO_3 in the leaching solution diminish the yield of Al_2O_3. The addition of caustic alkali in amounts of 0.25 to 0.75, when the R_2CO_3 exceeds 1 mole, has no effect on the yield of Al_2O_3. Leaching is less effective with alkali hydroxide than with alkali carbonate. M.Ho.

Removing silica from solutions of aluminates. F. N. Strokov, V. A. Musiakov, and R. V. Prokof'eva. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940**, No. 32, pp. 147–66; *Khim. Referat. Zhur.*, **4** [2] 84 (1941).—An investigation was made to elucidate the physicochemical processes which take place during the removal of silica from aluminate solutions by treatment in an autoclave in the presence of lime. It was assumed that an aluminate solution is a mixture of solutions of alkali aluminate and alkali silicate. The results justify the assumption that the structure of SiO_2 compounds in alkali silicate and aluminate solutions is identical. In the removal of silica from a solution of aluminate without the use of lime, the basic reaction involved is the formation of insoluble alkali aluminosilicate ($Na_2O \cdot Al_2O_3 \cdot 2SiO_2 \cdot nH_2O$). When lime is used, a calcium aluminosilicate ($3CaO \cdot Al_2O_3 \cdot nH_2O$) is formed by the action of lime on the more rapidly forming aluminosilicate, displacing the alkali. M.Ho.

Salt solutions acting as binders. I. N. Sapgir, Yu. N. Tomskiĭ, and P. Epel'baum. *Tekh. Okraski*, **1940**, No. 1, pp. 23–32; *Khim. Referat. Zhur.*, **4** [1] 134 (1941).—The preparation of resistant and quick-drying coatings for wood, metals, and glass from pastes made from powdered Zn and Zn dust in combination with aqueous solutions of alkali, alkaline-earth, and other metal chlorides was investigated. The "chloride" films formed from these pastes have many valuable properties such as good adhesiveness, resistance to washing, strength, fire resistance, and apparently corrosion resistance. With pigments or without them such coatings can be used either as paints or primings for subsequent painting. They resemble cement in their binding properties and can be used as a mineral calking compound. Other salts, e.g., $Al_2(SO_4)_3$, can be used for such purposes, and bromides, iodides, and fluorides can be used instead of Cl. M.Ho.

Side reactions occurring during the calcination of a nepheline-lime batch and leading to the formation of compounds related to the system CaO–Al_2O_3–SiO_2 and the conditions for their decomposition. F. N. Strokov, V. A. Musiakov, and V. S. Volkov. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940**, No. 32, pp. 64–72; *Khim. Referat. Zhur.*, **4** [2] 82 (1941).—During the heating of a mixture of CaO, Al_2O_3, and SiO_2 (in ratios of a nepheline charge) at 1200° to 1300°, the binary compounds $CaO \cdot Al_2O_3$ and $2CaO \cdot SiO_2$ and the ternary compounds $2CaO \cdot Al_2O_3 \cdot SiO_2$ (gehlenite) and $CaO \cdot Al_2O_3 \cdot 2SiO_2$ (anorthite) are formed. In a nepheline batch, along with the main reaction between nepheline and lime, $R_2O_3 \cdot Al_2O_3 \cdot 2SiO_2 + 4CaCO_3 \rightarrow 2(2CaO \cdot SiO_2) + R_2O \cdot Al_2O_3 + 4CO_2$, the above-mentioned compounds are formed because of the stoichiometric conditions caused by the volatilization of alkalis during the heating. The gehlenite and anorthite are not soluble under the conditions used for leaching the calcine, and the Al_2O_3 they contain is lost. When heated at 1300°, the gehlenite and anorthite decompose, forming $2CaO \cdot SiO_2$ and Ca metaluminate. M.Ho.

Silicates of calcium. Thorbergur Thorvaldson. *Can. Chem. & Process Industries*, **26** [4] 197–99 (1942).—The main product of the hydration of both β-dicalcium silicate and tricalcium silicate is hydrated dicalcium silicate. B.L.

Synthesis of hydrated calcium aluminates from lime and a solution of sodium aluminate. Ya. M. Pesin, A. F. Dumskaya, and O. L. Rivina. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940**, No. 32, pp. 25–40; *Khim. Referat. Zhur.*, **4** [2] 81 (1941).—As a result of the reaction between lime and a solution of aluminate at 70°, a mixture of tricalcium and tetracalcium aluminate is obtained. At a concentration of Al_2O_3 of 4 to 100 gm. per liter, a mixture of tricalcium and an appreciable amount of tetracalcium aluminate is formed. At a concentration of 100 to 200 gm. per liter, practically pure $3CaO \cdot Al_2O_3 \cdot 6H_2O$ is formed. A crystallographic analysis showed that, at a concentration of Al_2O_3 of 200 gm. per liter, the entire solid phase consists of an isotropic substance of which the index of refraction is 1.605; this is very close to the index of refraction of tricalcium aluminate (1.604). Chemical and rational analyses showed that nearly the entire solid phase consists of $3CaO \cdot Al_2O_3 \cdot 6H_2O$. An increase in the concentration from 54 to 350 gm. per liter (at Al_2O_3 concentrations of 50 and 100 gm. per liter) did not seem to affect the composition of the calcium aluminate. M.Ho.

Enamel

Colors of furniture. PARRY MOON. *Jour. Optical Soc. Amer.*, **32**, 293–98 (1942).—M. presents final data on an investigation of the reflection factors and trichromatic coefficients of 602 materials used in interiors. A table summarizes the maximum, minimum, and representative reflection factors for various types of ceilings, walls, floors, and furniture. Furniture is found to be much too dark, and it is suggested that furniture makers profit from the bright enameled steel of modern kitchens. A.P.

Effect of the temperature on the enamel slip and enameling. H. LANG. *Glashütte*, **70** [17] 217–18 (1940).—The temperature of the enamel slip must be kept constant. In summer the mills should be water-cooled to prevent the slip from becoming overheated during grinding and from drying too rapidly, which will cause defects such as fish-scaling, loss of luster, and fire cracks in the finished coat. When enamel is aged in hot weather, it may become thick or ferment and is difficult to work. Other defects arise in cold weather if the slip is permitted to get too cold. When ground at low temperature, the slip is deficient in alkalis, deposits too rapidly, and produces cloudiness, a rough surface, and excessive hardness. If the slip becomes very cold during aging, the above defects are intensified and the enamel and water will separate. Cold slows down the drying process, causing brittleness in the enamel and loss of time. Heating in winter is more difficult than cooling in summer unless hot water can be substituted for cold in the cooling system. Other heating arrangements are suggested. M.V.C.

Manufacture of porcelain enameled hot-water tanks at the plant of the Fowler Manufacturing Co., Portland, Oregon. ANON. *Ceram. Age*, **38** [1] 12–13 (1941).—Progressive steps in the manufacture of porcelain enameled hot-water tanks are briefly described and illustrated. F.G.H.

Porcelain enamel in war work. CHARLES S. PEARCE. *Bull. Amer. Ceram. Soc.*, **21** [8] 162–64 (1942).

Powder enameling on cast iron. H. LANG. *Keram. Rundschau*, **49** [9] 89–91; [10] 98–100; [11] 113–14; [13] 132–34 (1941).—L. describes the development of processes and furnaces used in applying powdered enamel on cast iron. Generally, the cleaned cast iron object is heated to red heat, and the dry powdered enamel is then scattered on the surface or, by suitable tools, is distributed to inner surfaces and recesses. Special tools have been developed for automatically powdering large surfaces (bathtubs). Formerly, lead-containing enamels did not require reheating, as they were melted by the retained heat of the piece from the furnace; recent lead-free enamels have a higher melting point, however, and it is necessary to return the piece to the furnace for a short time to obtain a smooth surface. The enamel layer is of a better quality if a wet ground enamel is first applied, especially with difficult pieces. The ground enamel also protects the cast iron from scaling (burning), increases the adherence of the powdered enamel layer, and makes the layer more resistant to impact. The ground enamel is applied by dipping, pouring, or, mostly, spraying. This coat should be very thin except on places which burn easily. Defective spots on the surface should be mended before application of the ground coat. The piece, dried or not dried, is then heated 15 to 20 min. before the powder enamel is applied. Special arrangements in the furnaces to simplify handling of the hot pieces while powdering and reheating and special equipment are described. M.HA.

Weather resistance of porcelain enameled iron structural units. WILLIAM N. HARRISON AND DWIGHT G. MOORE. *Jour. Research Nat. Bur. Standards*, **28** [6] 735–54 (1942); RP 1476. Price 10¢.—A study of the weathering resistance of vitreous enameled architectural panels was begun by the National Bureau of Standards in 1939. The study involved 864 1-sq. ft. panels and 4- x 6-in. laboratory specimens, representing 14 types of enamel. At the end of the first year of exposure at 4 locations selected for different climatic conditions, over half of the panels showed no visible weathering effect, and in no case did weathering produce any failure of the enamel to protect the underlying metal from rusting. The full-mat enamels are unsuited for architectural use where appearance is important, because of fading and of difficulty in cleaning. Mild fading, found on some of the nonacid-resistant colored enamels, was associated with a minute pitting of the enamel surface, probably caused by the presence of acid-forming gases in the atmosphere. Enamels having high acid resistance did not show this effect. Weathering of the panels was more pronounced at those locations where there is a relatively high concentration of combustion gases and less severe where these gases are practically absent in the atmosphere. An accelerated weathering test which gives an effect closely resembling the most important form of actual weathering is described. R.A.H.

Wet enameling of cast iron without ground enamel. H. LANG. *Glashütte*, **70** [13] 170–72; [14] 183–84 (1940).—When enameling cast iron without a ground coat by the wet process, firing is not only essential but must be sharper and longer. Besides its reduced cost, the enamel layer without a ground coat has high impact strength and exceptional adherence. Good results have also been obtained with acidproof enamels without a ground coat. The surface of the cast iron is a vital factor in one-coat enameling and should be as fine-grained and as dense as possible. M.V.C.

PATENTS

Coating metal surfaces. W. C. MORRIS (Poor & Co.). U. S. 2,294,760, Sept. 1, 1942 (Jan. 12, 1940).

Coating metal surfaces. W. C. MORRIS (Poor & Co.). U. S. 2,294,761, Sept. 1, 1942 (July 20, 1940).—A process of preparing a self-bonding glass or enamel composition for use in enamel-coating processes which consists in preparing a glass frit having a maturing-temperature range between 1460° and 1620°F., reducing the frit to a milled slip, separately premilling a mix containing antimony trioxide blended with a thermally stable rare-earth phosphate, and incorporating this premilled mix in the frit as a mill addition thereof.

Enamel composition. KARL KAUTZ (Climax Molybdenum Co.). U. S. 2,293,146, Aug. 18, 1942 (Aug. 10, 1940).—The process of enameling iron metalware comprising milling the frit with an oxide of molybdenum and with an oxide of antimony, the amount of the molybdenum oxide with relation to the frit being 0.25 to 5.0% by weight and the amount of the oxide of antimony being twice the amount of the molybdenum oxide, applying the milled mix to a metal surface, and firing it, thereby forming the readily fusible antimonyl molybdate to give an enamel of good adherence to iron.

Method and apparatus for producing vitreous enamel. R. C. BOYD, H. C. ROACH, AND C. E. MCNEAL (American Radiator & Standard Sanitary Corp.). U. S. 2,294,828, Sept. 1, 1942 (Feb. 28, 1941).—A method of producing enamel chips directly from molten enamel which comprises discharging a stream of molten enamel which has been raised to a temperature of about 1700° to 2000°F., intercepting such stream and substantially simultaneously cooling and deforming it to lower its temperature abruptly and to convert it to plastic sheetlike form at a temperature of about 1000° to 1400°F., further cooling the sheetlike enamel at a relatively slow rate until it reaches a temperature of about 800° to 1100°F., which is just above the annealing range of the particular composition involved, and then rapidly cooling the enamel to a temperature below its annealing range and below about 750°F. but not less than about 300°F., whereby the enamel spontaneously breaks up first into plates and then into chips which are brittle and highly strained and which are in a condition favorable for ready conversion into powder form.

Producing antislip surfaces for bath floors. C. T. GORDON (Porcelain Metals Corp. of Louisville). U. S. 2,292,369, Aug. 11, 1942 (Oct. 19, 1939; Aug. 12, 1940).

Vitreous enamel bath floor. C. T. GORDON (Porcelain Metals Corp. of Louisville). U. S. 2,292,368, Aug. 11, 1942 (Oct. 19, 1939).

Glass

Benefits through science. A. SILVERMAN. *Amer. Glass Rev.*, **61** [40] 15, 26 (1942).—S. reviews scientific progress in glass manufacture to show that America is forging ahead of the rest of the world and can maintain that position by continued application of science. A.P.

Colored glasses: extinction coefficients for chromium and cobalt. S. R. SCHOLES AND R. H. DOWS. *Glass Ind.*, **23** [8] 301–303, 307 (1942).—Information on the behavior of light as it passes through colored glass is presented. Standardized nomenclature is discussed for transmittance, transmission, optical density, and extinction coefficient (ϵ). Different elements have widely different coefficients of extinction, and it would be useful to make the values available. Cobalt and chromium were studied. To a soda-dolomite batch as base, 0.10 to 0.50% Cr_2O_3 in steps of 0.05% and equal amounts of antimony oxide to reduce any CrO_3 were added. Similarly, Co_3O_4 was added in varying amounts. Averaged values of ϵ are as follows:

Wave length ($m\mu$)	470	520	580	600	650
Chromium	3.33	1.07	1.15	1.88	3.43
Cobalt	7.39	25.7	34.7	43.8	41.5

It is stressed that ϵ for any element is a constant only for a given type of glass, for a narrow composition range, and for a fixed state of oxidation. A.P.

Decreasing the alkali content in bottle glass. S. YA. RAF. *Stekolnaya Prom.*, **1940,** No. 8, pp. 6–7; *Khim. Referat. Zhur.*, **4** [2] 86 (1941).—The following composition was worked out for the mechanical manufacture of bottles: SiO_2 72.5, R_2O_3 2.0, CaO 6.5, MgO 3.5, R_2O 15.0, and SO_3 0.4%. This composition is used at the Roslavl bottle works. Production results showed that high-grade bottles can be manufactured on a Lynch machine from a glass containing 14.8 to 15% of Na_2O. M.Ho.

Dependence of the ultrasonic refraction figures in glasses on prismatic form. H. RÖTGER. *Naturwissenschaften*, **28** [40–41] 644–45 (1940); abstracted in *Physik. Ber.*, **22** [1] 10 (1941).—Experiments made with acoustic waves of 7,600,000 cycles per sec. showed that the location of the nodal points of the Schaefer-Bergmann interference figures are, for a definite radiation, dependent on the shape of the oscillating glass and can easily be calculated. In triangular prisms, refraction pictures show clearly primary and secondary reflection of acoustic and thrust waves. This fact can be used to obtain much greater accuracy and simplification in the evaluation of refraction measurements. M.Ha.

Development and testing of new glass at American Optical Co. ANON. *Glass Ind.*, **23** [4] 140–42 (1942).—The steps in the preparation and investigation of experimental glasses in the research laboratories of the American Optical Co. are described in 17 pictures and their legends. A.P.

Effect of storage conditions on weathering of commercial glass containers. J. S. OWENS AND E. C. EMANUEL. *Jour. Amer. Ceram. Soc.*, **25** [13] 359–71 (Sept., 1942).—4 references, 7 figures.

Foam glass: II. E. L. KREIDL. *Glass Ind.*, **23** [8] 304–305, 318 (1942).—Foam glasses are prepared (*A*) from seedy glasses, (*B*) from glasses containing special ingredients causing gas evolution in the softening range, (*C*) by introducing gases into molten glass from an extraneous source, and (*D*) by introducing gases into crushed glass while sintering. For Part I see *Ceram. Abs.*, **21** [9] 186 (1942). A.P.

Glass from the atomic view. ALEXIS G. PINCUS. *Ceram. Age*, **39** [2] 38–41 (1942).—P. first gives a brief review of crystal structure fundamentals. Some of the characteristic technical facts about various simple glass compositions are presented. These facts are then briefly explained in terms of atomic structures. Illustrated. See *Jour. Amer. Ceram. Soc.*, **23** [10] 301–304 (1940). F.G.H.

Glass factory as a source of supply of metals. F. MERGLER. *Glashütte*, **70** [12] 157–58 (1940).—Methods of salvaging lead and iron in glass plants are presented. In the manufacture of lead glazes, some lead or lead compounds are lost through evaporation. This lead is precipitated mainly on the chamber blocks, which, in the course of a year or two, acquire a high lead content. This lead and that from discarded glass pots are being retrieved in Germany. The coal ash from glass factories is a recognized source of iron oxide. Coal ash, especially briquette ash, because of its high iron and low manganese contents, is an excellent raw material for the production of ordinary brown glass. M.V.C.

Glass fiber manufacture. ANON. *Can. Chem. & Process Industries*, **26** [2] 81–82 (1942).—Some uses are mentioned. B.L.

Glass goes to war. T. J. THOMPSON. *Bull. Amer. Ceram. Soc.*, **21** [8] 161–62 (1942).

Glass industry in India. ANON. *Ceram. Age*, **38** [6] 172, 180 (1941).—Past and present practices are briefly reviewed. Illustrated. F.G.H.

Glassmakers, State prisoners. JOSEF BLAU. *Glashütte*, **70** [23] 289–90 (1940).—The earliest Bohemian glassmakers had no fixed place to work but wandered about Europe, disseminating their knowledge in all lands. By the 18th century, however, the glass industry had become one of the best sources of revenue for the State, and regulations and restrictions were imposed on glassmakers, forbidding them to travel or disclose their knowledge to foreign countries or to accept apprentices from foreign countries. Some of the restrictions imposed are quoted from the archives in Prague and Bistritz and the book, "Ceske sklo," by Mares, Prague, 1893. M.V.C.

Golden age of glass has truly begun. C. F. SULLIVAN. *Amer. Glass Rev.*, **61** [39] 13 (1942).—In an exceptionally favorable position during wartime, the glass industry must still look to its markets after victory has been won. Trade associations within the industry serve special groups, but to meet the offensive from competitive materials, an American glass institute is urged. A.P.

Graphite lubricants and their use in the glass industry. O. K. BOTVINKIN AND T. MARININA. *Stekolnaya Prom.*, **1940,** No. 8, pp. 13–16; *Khim. Referat. Zhur.*, **4** [2] 86 (1941).—The amount of colloidal graphite required for lubricating the surfaces of metallic molds in the glass industry was studied. A film of colloidal graphite was applied on the surface of cast iron, and the angle of wetting of the treated and untreated surface was then studied. It was found that (1) treating the surface decreases the degree of wetting of cast iron by glass, and (2) the film of colloidal graphite raised the temperature of the adhesion of the glass to the metallic surface. Extended testing showed the desirability of graphite lubrication under industrial conditions. M.Ho.

Making window glass in old days. ANON. *Amer. Glass Rev.*, **61** [40] 32–33, 54–55 (1942).—Methods used when window glass was blown by hand are described and illustrated by 5 photographs and drawings of the tools. A.P.

Making wood molds in a glass factory. WALTER GRÜBEL. *Glashütte*, **70** [17] 218–19 (1940).—New wood molds of pear-tree and beech-tree woods should be wired and treated with hot water. Care in handling the molds, removing the finished article immediately after blowing, dipping the mold in water after each piece has been blown, and boiling old frames prolong the life of the molds. M.V.C.

Manufacture of opaque sheet glass. RUDOLF HOHLBAUM. *Glashütte*, **70** [14] 181–83 (1940).—Machines for rolling the viscous opaque glass mass, the annealing furnace, the cutting table, and dressing machines devised by H. for the manufacture of ground and polished, fire-polished, and marbleized opaque sheet glass are described and illustrated. M.V.C.

Metallurgical study of cast iron for glass molds. W. H. BRUCKNER AND H. CZYZEWSKI. *Jour. Amer. Ceram. Soc.*,

25 [13] 381–88 (Sept., 1942).—11 figures. See "Report . . ," *Ceram. Abs.*, **21** [3] 59 (1942).

Mixing of batches and briquetting in the glass industry. E. BELANI. *Diamant*, **63** [1] 2–5 (1941).—The importance of very thorough and uniform mixing of even the smallest amount of a constituent in a glass without the formation of lumps is emphasized. A new type of counterflow rapid mixer is described which makes possible, in a few minutes, complete analytical homogeneity of the batch for the following glasses:

	Bottle glass		Window glass (white)	Plate glass (German)
	Green	Brown		
Sand	100	100	100	100
Na_2SO_4	30	34	41.0	48.3
Na_2CO_3	5		4.5	
$CaCO_3$	32	32	31.0	26.7
CaF_2		10		
Carbon	1	2	2.5	3.3
$NaNO_3$		10		
MnO_3	0.75			

The batch is placed on a rotating table only 12 to 14 cm. high and is mixed by Mn-hard steel mixing baffles and devices. Briquetting of the batch permits the storing of larger quantities in a small space. The briquettes contain 3 to 5% water; they do not disintegrate, and they become stone-hard after storing. Freedom from dust is an advantage from the sanitary standpoint, and no losses through dust are incurred. The charging of briquettes is simpler and quicker than that of a batch in powder form. The homogeneity of the melt gives better glass, and the melting capacity is 20 to 30% higher. Previous sintering of the compressed briquettes further shortens the melting time, and the lining of the melting tanks is attacked much less by this batch than by other batches because of the greater homogeneity of the melts; a furnace life of 2 to 3 years is normal. Briquettes were made of the following batches which can be used with or without the addition of cullet: (1) White glass: SiO_2 74.56, B_2O_3 0.50, Al_2O_3 1.0, CaO 4.72, Na_2O 11.65, K_2O 4.27, and MnO 0.21; (2) Blue glass: SiO_2 67.8, CuO 2.0, Al_2O_3 4.4, CaO 4.0, Na_2O 13.7, and K_2O 2.3; (3) Brown glass: SiO_2 100, CaF 10, Na_2SO_4 34, Na_2CO_3 0, $CaCO_3$ 32, and $NaWO_3$ 10.1. Machinery for briquetting is described. M.HA.

Mouth-controlled valve for compressed air in glass blowing. J. L. ALLISON. *Rev. Sci. Instruments*, **12** [4] 212–13 (1941).—A. gives details of the construction of the mouth-controlled valve for compressed air in glass blowing. R.H.B.

Newly discovered material of fused hard glass used in instrument jewel bearings. ANON. *Amer. Glass Rev.*, **61** [39] 8 (1942).—The fused hard glass used is called "Material H." It contains a high percentage of alumina and is particularly satisfactory for jewel bearings because of its impact strength. See "Glass replaces . . .," *Ceram. Abs.*, **21** [9] 186 (1942). A.P.

Optical glass industry before and after Abbe and Schott. ZSCHACKE. *Glashütte*, **70** [18] 229–30 (1940).—Excerpts from the writings of Abbe and Schott are given to show how optical glass was smelted before they revolutionized the technique and placed it on a scientific basis. M.V.C.

Oxidation-reduction equilibria in glass between iron and selenium in several furnace atmospheres. FRANK DAY, JR., AND ALEXANDER SILVERMAN. *Jour. Amer. Ceram. Soc.*, **25** [13] 371–81 (Sept., 1942).—10 references, 9 figures.

Recent developments in heat-treating equipment. H. C. WELLER. *Amer. Glass Rev.*, **61** [40] 18, 44, 49–51 (1942).—During recent months the following important developments in heating equipment for the glass industry have been introduced: (1) a continuous conveyer type radiant tube fired furnace for bending sheet glass; (2) reannealing furnaces for optical glass; (3) radiant tube decorating kilns with reduced time cycles and no cars or special refractory setters; and (4) a multiflame firing system in conjunction with overhead recuperators for day tanks. A.P.

Replacement of oxygen in glass and its effect on adherence. W. A. WEYL. *Glass Ind.*, **23** [4] 135–37, 152 (1942).—The addition of KI to a sodium borate melt completely prevented wetting and adherence to the platinum of the melting crucible. This phenomenon may provide means to prevent sticking of the glass to metal molds during pressing, blowing, or casting. Adherence is favored by network-forming cations exerting residual valence forces and by oxygen bonds between glass and metal. This leads to a discussion of the possibilities and limitations of replacing oxygen by other elements. From the viewpoint of crystal chemistry, fluorine is a logical substitute for oxygen, and advantages derived from this substitution in special cases are described. The substitution of sulfur and selenium for oxygen leads to novel results. A.P.

Sodium silicate as a substitute for sodium carbonate in glass manufacture. V. S. PODELSKIĬ AND N. P. KRASNIKOV. *Prom. Stroitel. Materialov*, **1940**, No. 9, pp. 57–61; *Khim. Referat. Zhur.*, **4** [2] 86 (1941). M.Ho.

Strides made in glass as a critical materials substitute assures industry's future. W. H. CURTISS. *Amer. Glass Rev.*, **61** [35] 9, 12, 14 (1942).—The history of the glass industry for the last 40 years has been marked by repeated invasions of other fields as the true nature of this versatile product has been explored by research. The wide range of properties, the strength characteristics, and new methods of manufacture are assuring that glass is not a temporary substitute but a distinct improvement over traditional materials for a variety of uses. Twelve special uses for tempered sheet glass are listed. Glass is also replacing critical materials for insulation; flotation material in life boats, life jackets, and bridge pontoons; jewel bearings; spray nozzles; springs; and electrical parts, particularly for ultrahigh-frequency radio equipment. A.P.

PATENTS

Abrading machine. G. W. JACKSON AND W. P. CANNING (American Optical Co.). U. S. 2,291,629, Aug. 4, 1942 (July 28, 1941).

Apparatus for fusing silica. P. K. DEVERS (General Electric Co.). U. S. 2,292,826, Aug. 11, 1942 (Oct. 21, 1939).

Apparatus for washing sheet glass. C. B. SCHAFER (Libbey-Owens-Ford Glass Co.). U. S. 2,293,858, Aug. 25, 1942 (Jan. 25, 1941).

Coating of glass. E. I. DU PONT DE NEMOURS & CO. Brit. 546,246, July 15, 1942 (Jan. 2, 1940).

Feeding glass. C. T. SLOAN (Jeannette Glass Co.). U. S. 2,293,860, Aug. 25, 1942 (March 8, 1940).

Forming articles of hollow glassware. R. W. CANFIELD AND THOMAS WAUGH (Hartford-Empire Co.). U. S. 2,292,048, Aug. 4, 1942 (May 19, 1939).

Forming batch bodies. G. W. BATCHELL. U. S. 2,294,373, Sept. 1, 1942 (June 17, 1939).—The method of forming a glass batch which consists in melting certain of the solid subdivided glass batch materials, flowing the molten glassy material, subjecting the interior of the flowing molten glassy material to air pressure to cause it to flow in hollow form, and causing solid subdivided batch materials to move gravitationally into the interior space of the hollow flowing molten glassy material.

Gathering molten glass. E. T. FERNGREN. U. S. 2,292,370, Aug. 11, 1942 (April 29, 1938).

Glassmaking. R. H. BARNARD. U. S. 2,294,266, Aug. 25, 1942 (April 9, 1941).—An apparatus for making glass wool.

Glass pipe and coupling therefor. L. G. CRANE AND H. J. TILLSON. U. S. 2,294,160, Aug. 25, 1942 (May 4, 1940).

Machines for molding hollow glass articles. A. W. PARFITT (Owens-Illinois Glass Co.). Brit. 546,022, July 8, 1942 (Nov. 21, 1940).

Manufacture of drawn glass. C. F. WOOD (American Window Glass Co.). U. S. 2,293,377, Aug. 18, 1942 (Nov. 19, 1938).

Manufacture of optical glass. F. J. DOBROVOLNY (E. I. du Pont de Nemours & Co.). U. S. 2,294,077, Aug. 25, 1942 (Dec. 23, 1940).—The process for making optical glass which comprises fusing a mixture of glassmaking ingredients containing at least one alkali metal carbonate and a limited quantity of sodium monoxide in such proportion that the molar ratio of sodium monoxide to total alkali metal carbonate is less than 0.3 to 1 but not less than 0.1 to 1.

Means for manufacturing glass. YVAN PEYCHES (Soc. Anon. des Manufactures des Glaces & Produits Chimiques de St.-Gobain, Chauny & Cirey). U. S. 2,293,948, Aug. 25, 1942 (Sept. 15, 1939).

Metallic coated ceramic ware. H. W. GILLETT (Battelle Memorial Institute). U. S. 2,292,026, Aug. 4, 1942 (Dec. 15, 1939).—An article of manufacture comprising glass coated with at least one of the metals from the group of metals consisting of zirconium and titanium.

Metallizing glass. C. D. HAVEN (Libbey-Owens-Ford Glass Co.). U. S. 2,293,822, Aug. 25, 1942 (Oct. 4, 1939). —The process of metallizing glass, including the step of spraying a molten metal alloy upon the glass comprising approximately $\frac{1}{2}$% to 4$\frac{1}{2}$% titanium and the remainder substantially all copper.

Method and apparatus for producing glass fibers. GEDEON VON PAZSICZKY (vested in the Alien Property Custodian). U. S. 2,294,588, Sept. 1, 1942 (Nov. 6, 1939).

Method of differentially opacifying glass. H. H. BLAU (Corning Glass Works). U. S. 2,292,684, Aug. 11, 1942 (June 10, 1941).—The method of making a differentially opacified glass article which comprises forming a substantially unopacified article from a thermally opacifiable glass, applying to selected areas of the article a thermal resist comprising a heat-insulating material of low thermal conductivity bonded with a soluble salt which is substantially infusible at the opacification temperature of the glass, heating the article at a temperature and for a time sufficient to opacify the unprotected areas, and washing off the thermal resist.

Ophthalmic lens. E. D. TILLYER (American Optical Co.). U. S. 2,291,663, Aug. 4, 1942 (Dec. 21, 1939).

Phosphate glass batch. FREDERICK GELSTHARP (Pittsburgh Plate Glass Co.). U. S. 2,294,844, Sept. 1, 1942 (April 1, 1939).—A phosphate glass batch comprising 50 to 100% by weight of aluminum metaphosphate, 0 to 26% by weight of an alkali metal monophosphate, and 0 to 27% by weight of monomagnesium phosphate.

Producing tempered glass sheets. EDOARDO FERLITO. U. S. 2,293,537, Aug. 18, 1942 (Nov. 1, 1938).

Structural Clay Products

Cavity wall. HARRY R. KREITZER. *Ceram. Age*, **38** [5] 136 (1941).—K. discusses the cavity-wall construction from the standpoints of structural strength, design, and resistance to moisture penetration. F.G.H.

Doweled masonry. FREDERICK HEATH, JR. *Bull. Amer. Ceram. Soc.*, **21** [8] 165–66 (1942).—3 figures.

Iowa structural clay products industry. O. J. WHITTEMORE, JR. *Ceram. Age*, **38** [4] 112–13 (1941).—All of the Iowa structural clay products plants, except for one small dry-press plant, are stiff-mud plants. Almost all clay is mined from open pits by power shovels, cranes, and shale planers. Overburden is stripped with hydraulic equipment, wheeled scrapers, and caterpillar tractors. The clay is ground with rolls, dry pans, and hammer mills. Practically all of the auger machines used are deairing. The driers are for the most part waste-heat tunnel driers. There are some steam tunnel driers and slatted floor sewer-pipe driers. Firing is done in round down draft kilns varying from 28 to 34 ft. in diameter with the exception of one Haigh continuous kiln and one Goldner kiln. Bituminous coal from Illinois and western Indiana is the more common fuel, but some Iowa coal is used; the objections to Iowa coals include their high sulfur and ash contents. Two plants, both large producers, are using natural gas through pipe lines from the mid-continent fields. F.G.H.

Permanent lane markers at Canton. J. A. SHISLER. *Eng. News-Record*, **129** [7] 221 (1942).—S. describes the traffic and parking-lane markers used in re-laying the old brick pavement on Cherry Ave., Canton, Ohio. The marker brick are a light buff color, have a wire-cut lug pattern with a smooth surface for the reflection of light, and were subjected to the same A.S.T.M. tests as other paving brick. G.A.K.

Pumping stations can be attractive. ANON. *Eng. News-Record*, **129** [8] 260–61 (1942).—Eighteen pumping stations built by the U. S. Engineers Department are designed to conform with the architecture of the district in which they are built. Some located in high-class residential areas have exterior walls of red brick, a decorative effect being obtained by a glass block panel over the entrance and perpendicular glass block windows. Illustrated. G.A.K.

PATENTS

Building block. M. E. FREEMAN. U. S. 2,294,776, Sept. 1, 1942 (Jan. 9, 1941).

Composite tile structure. E. R. POWELL. U. S. 2,292,-085, Aug. 4, 1942 (Dec. 7, 1937).

Refractories

Action of alkalis on refractory materials: XVI, Experiments on the expansile effect of alkalis at 1000° to 1400°C. F. H. CLEWS, H. M. RICHARDSON, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 61, p. 67 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 61–62 (Oct., 1941).—The theory that the reaction of alkalis with aluminosilicate refractories is accompanied by an expansion when combination occurs without liquefaction is further confirmed. Briquettes of mixtures of sodium aluminate with various proportions of (*a*) alumina, (*b*) sillimanite, and (*c*) calcined china clay were measured after heating at temperatures from 1000° to 1400°C. Contractions were observed only at those temperatures and for those compositions where liquid products might be expected; otherwise, the briquettes tended to expand. For Parts **XIV** and **XV** see *Ceram. Abs.*, **21** [1] 13; [4] 83 (1942). P.S.D.

Action of chlorine on refractory materials: IV, Effect of chlorine treatment on some properties of fire-clay and diatomite products. H. M. RICHARDSON, F. H. CLEWS, L. R. BARRETT, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 61, p. 59 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 70–73 (Oct., 1941).—Samples of firebrick were exposed to chlorine at 1000°C. for 20 hr. A loss in weight of 1.25% occurred through the volatilization of iron chloride and other chlorides. The physical properties of the firebrick remained practically unaltered. Another product originally susceptible to disintegration by carbon monoxide at 450°C. was rendered inert by similar chlorine treatment. A diatomite product was chlorinated for 10 hr. at 1000°C. The resulting material was appreciably more refractory. It stood up better after contraction and deformation under load at 1200° and 1300°C. than the untreated brick and was also superior in this respect to a product which had received similar heat-treatment omitting the chlorine. The crushing strength was intermediate between that of the untreated and the heat-treated samples. For Parts **I–III** see *Ceram. Abs.*, **21** [1] 13 (1942). P.S.D.

Alumina from bauxite by calcining with soda. I. S. LILEEV, V. S. VOLKOV, AND V. A. GERMAN. *Shornik*

Rabot Gosudarst. Inst. Priklad. Khim., **1940**, No. 32, pp. 179–99; *Khim. Referat. Zhur.*, **4** [2] 84 (1941).—It is assumed that calcining of bauxite with $CaCO_3$ and Na_2CO_3 is advisable only if the leaching is done rapidly and at low temperatures (30° to 40°). When the leaching is prolonged and at higher temperatures, the effect of $CaCO_3$ is nullified; in such instances, the bauxite should be calcined only with Na_2CO_3. From Tikhvin bauxite (containing Al_2O_3 up to 50% and SiO_2 up to 12%) calcined with soda, 82 to 84% of Al_2O_3 was leached out. The batch was made to contain 1 mole of Na_2CO_3 for 1 mole of Al_2O_3 and 1 mole of Na_2CO_3 for 1 mole of Fe_2O_3; it was heated at 1100° to 1200°. The calcining of strongly siliceous bauxite with soda sharply decreases the yield of Al_2O_3 and therefore has no practical application. Best results were obtained with a leaching solution containing 10% of Na_2CO_3, to which was added 10 gm. per liter of CaO, and the leaching was done at the boiling point of the solution. In any Na_2CO_3 batches, the loss of $CaCO_3$ is eliminated; the use of Na_2CO_3 per ton of Al_2O_3 is 25% higher than at the present, and the irrecoverable loss of Na_2CO_3 is accordingly 0.1 ton higher than in the soda-lime method. With the soda method, lime is eliminated, a more porous product which does not require grinding is obtained, and the sludge is considerably decreased. The disadvantages include its applicability only to high-grade bauxite and an increased demand for labor for the evaporation process because of a higher content of soda (25 to 30%). See *Ceram. Abs.*, **21** [9] 189 (1942). M.Ho.

Attack on refractory materials by alkali chlorides. W. T. Gardner. *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, p. 88 (Oct., 1941).—G. describes the condition of the fire-clay floor tile of a battery of coke ovens which had been in operation for 15 months carbonizing wet salty coals. The expansile action of the chlorides is shown in the convex shape assumed by the floor. There was very little evidence of fusion at the temperature of operation, although the alkali content had risen from 1.8 to 7.0%. P.S.D.

Behavior of refractory materials under stress at high temperatures: I, Introductory experiments with porcelain under torsion. F. H. Clews, H. H. Macey, and A. T. Green. *Bull. Brit. Refrac. Research Assn.*, No. 60, p. 31 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 50–55 (Oct., 1941).—These experiments were concerned with the behavior of porcelain under torsion at 900° and 1000°C. Porcelain was chosen as a convenient experimental material containing crystals in a glassy matrix. The use of torsional stress also had certain experimental advantages. Evidence was obtained for deformation which is (1) elastic, i.e., taking place immediately on both application and removal of the load, (2) viscous, i.e., total amount of deformation is proportional to the load and to the time and is not recoverable on removal of the load, and (3) viscous-elastic, i.e., deformation occurs at a decreasing rate and is slowly recoverable on removal of the load. The viscous-elastic effect in refractory materials at high temperatures may be a useful attribute. **II, Compression experiments on a refractory insulating product.** F. H. Clews, H. M. Richardson, and A. T. Green. *Bull. Brit. Refrac. Research Assn.*, No. 61, p. 51 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 55–64 (Oct., 1941).—Insulating firebrick were studied under compressive stress at 1100° and 1200°C. The rate of subsidence, at first extremely rapid, quickly decreased and was not found to be linear even after periods up to 250 hr. An empirical relationship applicable approximately for considerable periods of time is that the subsidence is proportional to the square root of the time involved. P.S.D.

Comparative data on the calcining of nepheline-lime and synthetic mixtures of similar composition. F. N. Strokov and P. D. Katsenelenbogen. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940**, No. 32, pp. 78–82; *Khim. Referat. Zhur.*, **4** [2] 82 (1941).—Synthetic mixtures were prepared by mixing Al_2O_3, SiO_2, Na_2CO_3, and $CaCO_3$, in molar ratios of $Na_2O:Al_2O_3 = 1:1$ and $CaO:SiO_2 = 1.8$ to 2.4:1, and approximately 2% (of the total weight) of Fe_2O_3. The mixtures were calcined for 2 hr. at 1000° to 1360°. The product was leached with NaOH or Na_2CO_3 at 70°, using 0.5 mole of Na_2O per mole of Al_2O_3 in the product. The results showed that, in synthetic mixtures, the aluminate was formed at a lower temperature because the Na_2CO_3 reacted with free Al_2O_3. In nepheline, the nucleus must be first decomposed, which requires higher temperatures. Calcining at 1300° and extracting Al_2O_3 with NaOH or Na_2CO_3 yield the same results for both synthetic mixtures and nepheline. The optimum CaO: SiO_2 molar ratio is 2:1. The composition of the product is determined by the temperature and the amount of CaO. M.Ho.

Development of the panel spalling test. Earl C. Petrie. *Ceram. Age*, **38** [3] 76–77, 79 (1941); see *Ceram. Abs.*, **21** [1] 14 (1942). F.G.H.

Disintegration of fire-clay products by mixtures of carbon monoxide and carbon dioxide. G. R. Rigby, H. Booth, and A. T. Green. *Bull. Brit. Refrac. Research Assn.*, No. 59, p. 90 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 64–70 (Oct., 1941).—Experiments show that the disintegrating action of carbon monoxide on certain susceptible firebrick at 450°C. is greatly decreased by the presence of 10 to 25% carbon dioxide. When the carbon dioxide content is reduced to 5%, the tendency of the products to disintegrate is as great as, if not greater than, that with pure carbon monoxide. P.S.D.

Examination of vertical retorts used for manufacture of activated coke. A. T. Green. *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 78–84 (Oct., 1941).—In the process of manufacturing activated coke, 0.5% sodium carbonate and 1.25% calcium carbonate are uniformly mixed with the coal charged to the retorts. Aggravated slag action on the retort walls is therefore a distinct possibility. Four retorts at a gas company works which had been using this process for 17 months together with two others in the same setting which had been worked normally were inspected. The four retorts which had been used in the activated-coke process showed erosion of the lower courses of the silica brickwork just above the sliding joint, especially in the corners. The two normally worked retorts showed a less marked action in similar positions. Analyses of affected brickwork indicated the presence of increased quantities of alkali and of lime in the surface layers. Attention is directed to the possibility of increased erosion and slag action in the producers and combustion chambers if activated coke is used in the process. P.S.D.

Extraction of alumina from aluminous raw materials: III, Production of crude alumina from high-alumina clay by means of acid and alkali treatment. Takamura Suzuki. *Jour. Soc. Chem. Ind. Japan*, **43** [10] 333–34B (1940)(in English).—If high-alumina clay is calcined at 550° to 800°C. and treated with acid, the alumina of the kaolinite in the clay goes into solution easily and 90 to 100% extraction is ensured. With alkali treatment of the insoluble residue, about 85% silica is easily dissolved, and insoluble crude alumina, which is essentially α-Al_2O_3, is obtained. Pure alumina is produced from the crude alumina by alkali treatment under high pressure, with a high yield and small loss of alkali. Crude alumina may also be used to produce high-alumina refractories or for other industrial purposes. **IV, Production of crude alumina from high-alumina clay by alkali treatment.** *Ibid.*, p. 334B.—If high-alumina clay is calcined at 950° to 1200°C. and treated with NaOH solution at atmospheric pressure, about 70% of the silica in the material dissolves quite easily, and the alumina remains insoluble. The crude alumina can therefore be obtained easily from the high-alumina clay by this process and may be used for the economical production of pure alumina by treatment with alkali solution under high pressure as previously described or by treatment with other alkali processes giving a high yield and a small loss of alkali. It can be used also as raw material for refractories. **V, Influence of calcining on the**

pulverization and various physical properties of high-alumina clay. *Ibid.*, pp. 334–35B.—High-alumina clay is easily crushed when calcined above 500°C. It is difficult to pulverize when calcined at 400°C. and much easier to pulverize at 450° to 500°C.; there is a gradual decrease in difficulty of pulverization as the temperature of calcining approaches 1000°C. Compressive strength is increased gradually by calcining, but it decreases above 800°C. Hardness increases from 3.5–5.5 to 8 (Mohs' scale) with the calcining temperature, but there is no further increase above 1000°C. The absorption of water is increased from 0.4–0.6 to 4–7% by calcining. Bulk specific gravity is decreased by calcining at 400° to 600°C. **VI, Extraction of alumina from high-alumina clay by the soda-lime process.** *Ibid.*, [11] 384–85B.—Alumina was extracted from the high-alumina clay (SiO_2 24.42%, Al_2O_3 55.48%) by the soda-lime process. Numerous experiments were carried out to determine the best conditions. The most effective mixing ratio of lime and soda is 2 moles $Ca(OH)_2$ to 1 mole of SiO_2 and 1.5 moles (in the hot water extraction) or 1.2 moles (in the extraction with NaOH solution) of Na_2CO_3 to 1 mole of Al_2O_3 in the material. The most effective calcining temperature is 1100° to 1300°C. From 90 to 91% of the alumina can be extracted. The amount of silica dissolved is 1 to 2% of the Al_2O_3 extracted in the hot-water extraction and 2 to 3% of that extracted with NaOH solution. The loss of alkali, calculated as Na_2CO_3, is about 10% of the Al_2O_3 extracted. **VII, Purification of sodium aluminate solution.** *Ibid.*, pp. 385–86B.—The impure sodium aluminate solution produced by the soda-lime process, containing 1 to 3% SiO_2, was purified by heating and agitating under atmospheric pressure or higher. The purification was carried out similarly with the addition of insoluble material such as pitch cokes, marble powder, Fe_2O_3, red mud from high alumina clay, and lime. Lime had the most effect; when no material is added, the rate of purification is very slow. The loss of alumina on purification, on the other hand, is largest when lime is added, while the loss is very small when no material is added. S. recommends the use of insoluble material other than lime for the purification of aluminate solution, as the loss of alumina is small and the rate of purification is high. **VIII, Purification of alumina containing silica as impurity.** *Ibid.*, [12] 430B.—The chemically pure aluminum hydroxide and silica were first mixed so as to contain 7.61% SiO_2; the mixture was then calcined at 1000° to 1200°C., treated with NaOH solution at 95°C., and filtered. This treatment was effective. Impure alumina from the soda-lime process, containing 1.55% silica, was calcined at 900° to 1400°C. and treated with NaOH solution. When the calcination temperature was 1300° to 1500°C., over 50% of the SiO_2 could be removed with a 2 to 3% loss of alkali. The mixture containing 7.61% SiO_2 was similarly calcined and treated with NaOH solution. The acid treatment of the residue further removed the alkali. The alumina containing 1.55% silica was calcined at 900° to 1400°C. and treated with NaOH and then with acid. With a calcination temperature of 1300° to 1400°C., about 70% of the silica was removed with a 3 to 4% loss of alumina. **IX, Properties of aluminum hydroxide precipitated from sodium aluminate solution under various conditions.** *Ibid.*, pp. 430–32B.—The properties of the aluminum hydroxide depend on whether the CO_2 method or the "seed charge" of aluminum hydroxide is used. Aluminum solution containing 48.0 gm. per liter Al_2O_3 and 64.3 gm. per liter NaOH, with the mol. ratio Al_2O_3 to Na_2O = 1:1.71, was used; CO_2 mixed with air in various proportions was blown into the solution, the temperature of the gas mixture being kept at 15°C. and that of the solution at 30°C. The more dilute the concentration of CO_2, the more rapid is the settling of the precipitate and the smaller is the volume. A solution containing 83.9 gm. per liter Al_2O_3 in the ratio Al_2O_3:NaO = 1:2.17 was decomposed by agitating it with the addition of a "seed charge" of aluminum hydroxide under various conditions. Precipitates produced under different conditions behaved quite differently. The precipitates were washed with water and centrifuged at 2500 r.p.m. for 5 min. Results with the CO_2 and seed-charge methods are shown in Tables I and II, respectively. For Parts I and II see *Ceram. Abs.*, **21** [8] 171 (1942). W.H.H.

Investigation of the permanent expansion of silica products containing cristobalite. G. R. RIGBY, A. E. DODD, R. P. WHITE, AND A. T. GREEN. *Bull. Brit. Refrac. Research Assn.*, No. 59, p. 99 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 74–78 (Oct., 1941).—Although the thermal expansion of unused silica brick from 20° to 1000°C. is usually completely reversible, silica brick which have been in service at 1600°C. or which have been heated to this temperature in the laboratory may show a permanent growth when their thermal expansion is determined. The permanent growth is attributed to the cristobalite; it occurs between 200° and 500°C., which includes the inversion temperature range of cristobalite, is largely unaffected by the rate of heating, and is diminished by the application of external stress. P.S.D.

TABLE I

Test	Al_2O_3 (gm./liter)	Temperature (°C.)	CO_2 (%)	CO_2 (liter/min.)	Vol. (cc./gm. $Al(OH)_3$)	Water content (gm./gm. $Al(OH)_3$)	Source of seeds
1	48.0	30	100	0.2	4.86	4.40	
2	"	"	50	"	2.61	2.09	
3	"	"	30	"	1.20	0.72	
4	83.9	"	100	"	1.37	0.94	
5	"	50	"	"	2.18	1.70	
6	"	60	"	"	3.15	2.70	

TABLE II

1	83.9	30	1.63	0.96	Decomposition with seeds
2	"	"	2.15	1.83	Alum and ammonia
3	"	"	1.89	1.16	CO_2 blowing
4	"	40	1.62	0.93	Decomposition with seeds

Lining the cupola with firestone. SIDNEY G. KOON. *Foundry*, **70** [2] 128–31 (1942).—In gray-iron cupola operation, factors which affect the life of a firestone lining include duration of heat, temperature, ash content of coke, velocity of the blast, nature of the material charged, and nature of the flux. Others are the use of seasoned stone, control of expansion of the lining, and proper application of lining or patching with reference to expansion. F.G.H.

Plastic refractories for industrial heating furnaces. G. W. HEALD. *Ind. Heating*, **9** [2] 232 (1942).—A plastic refractory (Ramtite) is described; it is claimed to be of

particular advantage for furnace linings, as its nonspalling properties enable it to resist the alternate heating and cooling to which most furnaces are subjected. The heat conductivity is about midway between the corresponding values for firebrick and insulating firebrick but nearer to the latter. Fuel consumption is reduced, owing to lower heat storage, and quicker heating results. M.Ha.

Problem of the second exothermal effect in the thermal analysis of refractory clays. A. K. Freberg. *Compt. Rend. Acad. Sci. U.R.S.S.*, **28** [1] 90–92 (1940); *Khim. Referat. Zhur.*, **4** [2] 85 (1941).—An investigation was undertaken to verify the assumption that the second exothermal effect observed in refractory clays is caused by the recrystallization of silica. For this purpose, a technically pure amorphous silica in the form of a gel was used. The thermal analysis was made in an N. S. Kurnakov apparatus. The results justify the assumption that one of the most likely causes of the second exothermal effect observed at 1200° to 1300° in thermal analyses of kaolinitic clays is the formation of cristobalite. M.Ho.

Progress report of other work of interest to gas engineers, and list of other investigations of the British Refractories Research Assn. Anon. *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 85–87 (Oct., 1941). P.S.D.

Refractory firebacks: I, Grate-back temperatures behind an open coke fire. L. R. Barrett, J. F. Clements, and A. T. Green. *Bull. Brit. Refrac. Research Assn.*, No. 61, p. 1 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 10–26 (Oct., 1941).—Temperatures and temperature gradients in the refractory fireback behind an open coke fire have been measured as a foundation for subsequent studies of the problem. Observations were sufficient to construct isotherms on the whole surface and on three vertical planes through the thickness of the fireback, i.e., (1) at the center, (2) in the corner, and (3) on the wing, at representative times during the experimental period. The dissection of the fireback into four pieces as the result of experience is supported by a qualitative analysis of the stresses. It is suggested, however, that a chair-back type of top brick is less likely to resist cracking than the alternative design using flat brick which is sometimes used. Lightweight clay insulating material used in place of the normal fireback reduced the "pull-through" time (the time in minutes between the shutting off of the gas for ignition and the time the fire shows red over half its top surface when viewed from above in subdued light). Replacing the rubble backing behind the normal grate back by lightweight clay insulating brick cut to shape reduced the temperature gradients after the first refueling, slightly increased the maximum temperatures, decreased the heat conduction through the refractory, and raised the temperature at which the temperature gradient in the fireback was reversed as the fire grew low. Removal of the rubble backing increased the temperature gradients after the first refueling, decreased the maximum temperatures, increased the heat conduction, and prevented the temperature gradient from being reversed. Either change from the standard rubble backing had very little effect on the pull-through time. The most efficient fireback, though not the most durable, would be one of lightweight material, either thicker than usual or lagged. P.S.D.

Refractory insulating materials: IV, Comparison of the properties of grog and dry-pressed grogged-clay brick made from cylinder- and pan-ground clay. L. R. Barrett, J. F. Clements, and A. T. Green. *Bull. Brit. Refrac. Research Assn.*, No. 61, p. 20 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 27–31 (Oct., 1941).—In a previous investigation, a description was given of the preparation of dry-pressed grogged-clay insulating brick in which highly porous, fine-pored grog was used. The refractory fireclay used in these mixes was cylinder ground to −100-mesh. Similar products from the same clay ground to −30-mesh in a solid-bottom pan were studied to determine whether the improvement in the product due to use of the finer material was commensurate with the additional cost of grinding. The use of the coarser clay reduced the cold crushing strength but slightly increased the refractoriness under load. The bulk density of the bodies containing −30-mesh clay was slightly lower. It was concluded that little additional advantage was obtained from finer grinding. The use of ball clay in the bond was likewise not specifically beneficial. **V, Further work on gradated brick.** *Bull. Brit. Refrac. Research Assn.*, No. 61, p. 26 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 32–36 (Oct., 1941).—Two methods whereby a single charge of material could be pressed in one direction to give a product of gradated density in one direction were investigated. In the first method, the mold was filled higher on one side than on the other and then pressed flat. Although a variable density was obtained it was not sufficient for the purpose intended. In the second method, a weak porous grog was used with the thought that the pressing operation might, by its crushing action, sufficiently consolidate the face receiving the pressure to make it slag resistant while leaving the remainder porous. In this method also, density differences between the face and the backing were insufficient for the purpose intended. Further experiments on the improvement of the cohesion between the layers of the three-layer gradated brick indicated that, when the content of porous grog for the porous section is 45%, the use of 45% of dense grog for the dense face involves no differential shrinkage. These were the proportions employed in the original experiments. **VI, Aluminous coatings for refractory insulating brick.** L. R. Barrett, W. F. Ford, and A. T. Green. *Bull. Brit. Refrac. Research Assn.*, No. 61, p. 34 (1941); reprinted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, pp. 37–49 (Oct., 1941).—The slag resistance of insulating firebrick may be increased by coating them with suitable mixtures before or after they have been built into a furnace structure. Mixes were prepared from precalcined china clay, kyanite, or fire clay as grog, bonded with ball clay, china clay, or fire clay. Additions of sodium silicate reduced the spalling resistance, but more than 0.5% of Na_2O, added as sodium silicate, was needed to obtain sufficient cold strength. From the viewpoint of spalling, ball clay was superior to china clay as a bond for calcined fire clay. The grading of the grog to give minimum porosity and permeability improved the resistance to attack by mill scale at 1350°C. Calcined kyanite was a more reliable constituent than calcined china clay, which tended to crack in the slag test. For Parts **I–III** see *Ceram. Abs.*, **21** [1] 15–16 (1942). P.S.D.

Research and refractory materials, 1940. F. H. Clews, A. E. Dodd, and A. T. Green. *Bull. Brit. Refrac. Research Assn.*, No. 59, p. 1 (1941); abstracted in *Rept. Refrac. Materials Joint Comm., 32d Rept., Gas Research Board Commun.*, No. 5, p. 85 (Oct., 1941). P.S.D.

Selection of refractory brick, shapes, and blocks. R. G. Lapsley. *Ceram. Age*, **38** [5] 149–50 (1941).—L. briefly reviews specification tests and prospective service conditions as the basis for proper selection of refractories. F.G.H.

Smalley checker system for regenerative-type furnaces. Anon. *Ind. Heating*, **9** [7] 930–34 (1942).—A checker system giving faster heats with greater efficiency of operation and lower fuel cost has been developed by the Harbison-Walker Refractories Co. Standard 9-in. straights are used for 80% of the structure. Special checker shapes tie the whole structure together. Rider arches and rider tile are arranged to permit uniform distribution of the gases through the regenerator and easy cleaning; the vertical flues are unrestricted as the cross checkers are not staggered. Air can be heated to 1800°F. or even higher. The application of this system to open-hearth furnaces and in glass-tank service is described briefly. In an open-hearth steel furnace, the checker replacement after 3 furnace campaigns (1450 heats) was 9%; previously, the checker replacement had been 25% after each campaign. M.Ha.

Testing of refractories for steel-plant use. F. F. FRANKLIN. *Ceram. Age*, **40** [1] 12–15 (1942).—F. briefly describes the following tests and their applications in the selection of refractories for steel plant use: (1) casual examination for color, texture, hardness, soundness, and odor; (2) chemical analysis; (3) fusion point; (4) porosity; (5) cold crushing resistance; (6) petrographic analysis; and (7) service trials on a small scale. F.G.H.

BOOK

Thermal Calculations for Industrial Furnaces (Wärmetechnische Rechnungen für Industrieöfen). W. HEILIGENSTAEDT. Verlag Stahleisen, Düsseldorf, 1941. 2d ed. 332 pp. Price Rm. 19.20 (Rm. 14.40 in U.S.A.). Reviewed in *Mech. Eng.*, **64** [8] 626 (1942).—H. discusses the thermal calculations required by the designer and operator of industrial furnaces. Essentially practical in intent, the theoretical material is expressed, wherever possible, in numerical tables, formulas, and rules for various calculations. Heat balance, combustion, heat transfer, conduction, and the heating process are considered, and many worked-out examples of calculations are given. This edition is considerably enlarged. A bibliography is included. F.G.H.

PATENTS

Chromite refractory. G. E. SEIL (E. J. Lavino & Co.) U. S. 2,292,903, Aug. 11, 1942 (Sept. 9, 1937).—A refractory material comprising chromite, stabilized calcium orthosilicate in physical and chemical equilibrium, and periclase, having substantially no residual free lime, substantially no free silica, and substantially no chromate.

Furnace arch. H. W. BEECHER (Gladding, McBean & Co.). U. S. 2,294,108, Aug. 25, 1942 (July 29, 1939).

Furnace lining. A. B. AGNEW (Harbison-Walker Refractories Co.). U. S. 2,291,938, Aug. 4, 1942 (May 9, 1940).

Furnace wall construction. L. S. LONGENECKER. U. S. 2,294,788, Sept. 1, 1942 (April 7, 1938).—A refractory block having on one of its faces a substantially V-shaped groove and on its other face a pair of triangularly shaped spaced marginally disposed tongues, each conforming in shape and size to the shape and size of one-half of the groove.

Magnesia refractory for brick and furnace linings. HONORARY ADVISORY COUNCIL FOR SCIENTIFIC & INDUSTRIAL RESEARCH. Brit. 546,400, July 22, 1942 (July 20, 1940).

Magnesia refractory for brick and furnace linings. N. P. PITT AND LISLE HODNETT (Canadian Refractories, Ltd.). U. S. 2,291,918, Aug. 4, 1942 (July 20, 1940).—In the production of refractory materials, the method which comprises forming by firing a thermoplastic refractory containing a major portion of highly refractory material, including periclase, and a minor portion of less refractory calcium ferrites and thereafter firing the material with finely pulverized silica to convert the lime of the ferrites into dicalcium silicate.

Manufacture of chromite refractories. R. HADDAN (Corning Glass Works). Brit. 546,196, July 15, 1942 (March 27, 1941).

Open-hearth furnace structure. G. L. DOW AND C. R. FONDERSMITH (American Rolling Mill Co.). U. S. 2,293,332, Aug. 18, 1942 (June 23, 1939).

Refractory. EUGENE WAINER (Titanium Alloy Mfg. Co.). U. S. 2,293,089, Aug. 18, 1942 (April 1, 1940).—A refractory structure comprising zircon, a refractory material taken from the class consisting of oxides, silicates, and carbonates of alkali metals, alkaline-earth metals, magnesium, and aluminum, and a continuous layer of zirconium oxide constituting a barrier between the zircon and the refractory material, whereby formation of a eutectic between the zircon and the refractory material is prevented.

Refractory brick and the molding thereof. R. J. TUGWOOD (R. P. Heuer). Brit. 546,220, July 15, 1942 (April 24, 1941).

Refractory composition and method of making. TITANIUM ALLOY MFG. CO. Brit. 546,387, July 22, 1942 (Jan. 25, 1940).

Refractory melting pots and methods of preparing them. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 546,371, July 22, 1942 (June 26, 1940).

Siliceous magnesia refractory manufacture. H. C. LEE (Basic Refractories, Inc.). U. S. 2,292,644, Aug. 11, 1942 (Jan. 15, 1938).—A process of making a refractory which comprises changing a periclase-merwinite composition to convert at least a part of the merwinite to a substantial amount of calcium orthosilicate by admixing calcareous material raising the lime-silicate ratio above 1.5 to 1 but not substantially over 1.85 to 1, whereby on raising the temperature of the mixture to reaction range such conversion occurs.

Spalling-resistant refractory. N. P. PITT, A. C. HALFERDAHL, AND F. E. LATHE (Canadian Refractories, Ltd.). U. S. 2,291,917, Aug. 4, 1942 (Nov. 6, 1939).—A method of making refractory material for spalling-resistant brick, furnace linings, etc., which comprises mixing with ground calcium silicate clinker having a lime to silica ratio between 1.8 and 2.4 not less than 3% nor more than 50% of a chrome ore component, of which the particle size is relatively coarse and in which the reactive silica does not substantially exceed 4%.

Terra Cotta

Eutin tile stoves from sketches of Wilhelm Tischbein. HANNA HOFMANN. *Keram. Rundschau*, **45** [25] 277–78 (1937).—The tile stoves designed by Tischbein had a rectangular base, and the main section rose straight and was sometimes divided into zones. Classical relief and friezes ornamented the stoves. The incrustation technique used by T. for making the tile frieze is somewhat like the Italian sgraffito technique; it is described and illustrated. M.V.C.

Nonmetallic chemical plant: I. A. E. WILLIAMS. *Engineer*, **174** [4512] 5–6 (1942).—W. describes the use of stoneware in chemical plants in Great Britain. Metal acid containers, filters, cooling coils, pipe lines, vacuum vessels, and autoclaves are replaced with stoneware, vitreous silica, glass, and other nonmetallic materials. Stoneware is resistant to the corrosive action of most acids. Storage vessels are made in one piece with a capacity of up to about 500 gal. For the storage of acids, a battery of stoneware vessels connected together by a series of siphon pipes is employed. Stoneware piping has two types of joints: the spigot and socket joint and ground conical flanges. In some cases the pipes and flanges are coupled together by means of special metallic clips, and alteration of the pipe circuit entails merely disconnecting the pipe couplings and inserting a new section. Absorption towers for absorbing or collecting gases use stoneware in their construction. Stoneware pumps are often used to circulate the liquid. Stoneware filters are extensively used because of their high resistance to corrosion and the ease with which they may be cleaned. **II.** *Ibid.*, [4513] 25–27.—Made by a patented process, Vitreosil is a product of over 99.8% pure silica. It withstands the corrosive action of most acids and sudden temperature changes and can be used for pipes for hot gases and acids, hydrochloric acid plants, and concentrators for sulfuric acid. Vitreosil coils are used for cooling and condensing, and because of their chemical inertness a high-purity distilled water can be obtained. **III.** *Ibid.*, [4514] 44–46.—Glass pipe lines operate satisfactorily at pressures up to 50 lb. per sq. in., and in some cases 100 lb. per sq. in. may be used. Borosilicate glass pipe lines are inert to most chemical action, are transparent, and are easily flushed with hot water, steam, or hot acid solutions. Synthetic materials and acid-resisting wood are also discussed. G.A.K.

Reforms in the construction of tile stoves. MICHAEL BIRKENBIHL. *Keram. Rundschau*, **46** [30] 333–36; [31] 344–47; [32] 358–60; [35] 395–96; [36] 406–407; [38] 447–50 (1938).—The evolution of the large ornamental tile stove is of interest from both the standpoints of art history and the development of the technique of heating. The first attempt to improve the primitive method of heating with a pit fireplace in the center of the room was made in 1325 when a structure was devised for the purpose of saving fuel. The first reform was the grate, followed by the modification of the ungainly size originally required to accommodate large logs, flues, the partitioning of the upper part of the stove into horizontal and vertical passages for the circulation of the hot gases, the use of material which heats quickly and holds the heat longer, etc. The contributions not only of potters and builders but also of mathematicians, physicists, and even philosophers, who introduced improvements from time to time until the tile stove embodied all the requirements of modern heating installations with regard to heating efficiency, economy, durability, beauty, and hygiene, are recounted in detail. Illustrated. M.V.C.

Tile stoves of the classical period. MICHAEL BIRKENBIHL. *Keram. Rundschau*, **45** [38] 432–35; [39] 445–49; [40] 458–59; [42] 482–85; [43] 495–96 (1937).—The classical Greek and Roman style in tile stoves was first revived in Paris and spread throughout Europe, gradually replacing the rococo style during the 18th century. The classical stove frequently resembled a monument, and the joints between the large ceramic pieces of which the stove was necessarily composed were scarcely noticeable. The basic tectonic principle of the classical stove lies in the superimposed cylinders. One or two cylinders form the fire chamber and the dome. A quiet white was the favorite color, but monochrome glaze, sometimes a discreet touch of gilt, mat rose, subdued blue, blue-green, veining, and less frequently black were also used. Relief decoration reached a high degree of refinement. The best-known classical artists and outstanding examples of German classical stoves are discussed. Illustrated. M.V.C.

Whiteware

Bulgarian porcelain raw materials. I. D. SEMENOW. *Keram. Rundschau*, **46** [31] 348–49 (1938).—The porcelain industry in Bulgaria has been in existence for about ten years, and raw materials were imported until native materials were discovered. The composition and properties of some Bulgarian kaolins, feldspars, clays, a laboratory product called Korniston, and another with a calcium silicate base are given. M.V.C.

Cleaning porcelain crucibles. JOHN E. D. CARWARDINE. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 533 (1942).—Place the crucible in a dish of fused potassium bisulfate for about 5 min. Remove, allow to cool, and wash with hot water. This method saves considerable time and confusion by cleaning "burner grime" and marking inks such as ferric chloride from porcelain crucibles. It does not injure the glaze in any manner but leaves the crucible with a perfectly clean surface. F.G.H.

Porcelain bushings. R. A. SNYDER. *Ceram. Age*, **38** [2] 37–38 (1941).—S. describes the processes involved in the production of apparatus and equipment insulators. Illustrated. F.G.H.

Porcelain line insulators. R. A. SNYDER. *Ceram. Age*, **38** [1] 5–6, 17 (1941).—Developments in the production of electrical porcelain line insulators are briefly reviewed. Illustrated. F.G.H.

Relation between chemical composition and fluidity of whiteware glazes and its technical significance. H. LEHMANN, K. ENDELL, AND H. HELLBRÜGGE. *Sprechsaal*, **73** [35] 307–12; [36] 321–26 (1940).—New glazes may be prepared either by testing proposed formulas or by systematic research. Both methods were employed in this investigation. From comprehensive practical experience in producing new types of glazes, an attempt was made to determine numerically the theoretical relation between the components of the glaze and its viscosity. For this purpose measurements of absolute viscosity were made by means of a torsional viscometer in platinum. In the ceramic industry the fluidity of the usually viscous glazes has long been determined, for plant control, by the channel viscometer. A glaze is mixed with dextrin to form a paste and allowed to flow at the firing temperature down a channel inclined at 45° or 30°. The distance the glaze flows before solidification is a measure of the viscosity or fluidity of the glaze. For practical operations the torsional viscometer is too complicated and expensive. Therefore the relation between the values obtained from the channel viscometer at certain temperatures and the absolute values of viscosity was determined. The relation between the fluidity and the $SiO_2 + Al_2O_3$ content of the glazes was called the viscosity index. As a first approximation, a preliminary calculation of the viscosity of the glaze is possible from the chemical composition. A confirmation by the channel viscometer gives valuable checks on the practical value of an experimental glaze. That the viscosity alone does not determine the utility of an experimental glaze is shown by microscopic examination, but the phenomena referred to are, to a certain extent, dependent upon the viscosity. W.H.H.

Tests applied to fired pottery products. W. D. SPORE. *Ceram. Age*, **38** [2] 42, 44 (1941).—S. describes the application of the following tests to chinaware: (1) absorption, (2) linear firing shrinkage, (3) thermal expansion, (4) moisture expansion, (5) oven test for checking thermal resistance, (6) modulus of rupture, (7) resistance to impact, and (8) chemical tests. F.G.H.

SEPARATE PUBLICATION

Staple Vitreous China Plumbing Fixtures. *Nat. Bur. Standards Com. Standards*, CS20–42, 36 pp. Free.—The revised standard is effective for new production from July 10, 1942. See *Ceram. Abs.*, **21** [7] 147 (1942). R.A.H.

PATENTS

All-ceramic denture base with teeth, process, and materials for producing. P. W. LEE AND CHARLES DIETZ (Dentists' Supply Co. of New York). U. S. 2,293,908, Aug. 25, 1942 (May 31, 1939).—A dental article comprising a preformed vitreous body of high fusing temperature comprising ingredients in the approximate proportions feldspar 70 to 90% and amorphous silica 10 to 30%, another vitreous body of relatively low fusing temperature fused thereto, and the low fusing temperature body comprising ingredients in the approximate proportions feldspar 65 to 80%, amorphous silica 10 to 20%, and borax glass 5 to 15%.

Forming all-ceramic denture. P. W. LEE AND CHARLES DIETZ (Dentists' Supply Co. of New York). U. S. 2,293,909, Aug. 25, 1942 (May 31, 1939; March 20, 1940).

Porcelain coffee-grinding element. ROBERT BROWN. U. S. 2,293,422, Aug. 18, 1942 (Oct. 18, 1938).—A grinding member for coffee grinders provided with teeth upon its active surface, the surface, including the teeth, being made of unglazed porcelain.

Spark plug. GENERAL MOTORS CORP. Brit. 546,370, July 22, 1942 (July 24, 1940). J. A. DORAN. U. S. 2,292,216, Aug. 4, 1942 (June 29, 1939).

Equipment and Apparatus

Care of conveyer belts: II. P. D. SULOFF. *Factory Management & Maintenance*, **100** [7] 116–17 (1942).—Hazards to belts are mentioned, and a program of inspection and repair is given. Control of tension due to various causes and external hazards such as tramp iron, mildew, and grease are discussed. For Part I see *Ceram. Abs.*, **21** [9] 202 (1942). N.R.S.

Complete solenoid control speeds Olean's conveyer system. L. H. CARGILL. *Glass Ind.*, **23** [8] 297–300 (1942).—To insure smooth, continuous operation at the packing tables, the Olean Glass Co. has installed a consolidated carton-conveying system. Because the two lehr rooms were separated by several buildings, the system was built above floor level with 12 double-width gravity-feed chutes. A traveling loader elevates the empty cartons to the power-driven belt. A dispatcher at a central station, equipped with a communications system, regulates the flow of the cartons by electric solenoid control. The gravity chutes are built with skate wheels to permit the light cartons to gain momentum and to avoid revolving. Cartons are transferred from the line belt to the gravity chutes by a triangle of live rollers driven by an independent motor and switch with a deflector gate at a $36^1/_2°$ angle operated from the central tower. A.P.

Control of drying in tunnel driers. GEORGE B. EYERLY. *Ceram. Age*, **38** [3] 72–73 (1941).—Fundamental principles are briefly reviewed. F.G.H.

Do's and don't's in starter maintenance. W. W. MCCULLOUGH. *Factory Management & Maintenance*, **100** [7] 113–14 (1942).—Excellent suggestions for maintaining starters at maximum efficiency are given. Across-the-line starters and reduced-voltage starters are dealt with separately. N.R.S.

Dry color manufacture. CLAYTON W. REYNOLDS. *Can. Chem. & Process Industries*, **26** [3] 133–37 (1942).—R. outlines methods of manufacturing chrome yellow, red dry colors, lake and earth colors, and lead products. Improvements in the properties of para, toluidine, lithol, and beta-oxy reds; indanthrene, toluidine, and lithol maroons; chrome, Hansa, and benzidine yellows; molybdate orange; and greens, blues, and violets are described. B.L.

Electromagnetic densitometer. A. R. RICHARDS. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 595–96 (1942).—An apparatus is described in which the principle of balancing the attraction of a magnetic field against the upthrust on a submerged armature is used as a rapid method of measuring liquid densities. The precision of the determinations depends on the range of the instrument and is of the order of 1 part in 800 for densities between 0.62 and 0.82 gm. per ml. Illustrated. F.G.H.

Exchange of heat and matter in drying wet materials. EMIL KIRSCHBAUM AND KARL KIENZLE. *Chem. Fabrik*, **14** [9] 171–81 (1941).—In an experimental installation for the evaporation of water and ethyl alcohol in air, in the process of drying, the course of changes in the air adjacent to the evaporating surface, the heat-transfer number, and the evaporation number were determined. The evaporation proceeded from the inner surface of ceramic filters having the shape of hollow cylinders, which were saturated from without with the liquids to be evaporated. The filters represented the wet material. The test results show that the change in condition of the air follows the law $di/dx = to$, that is, the rate of change in the heat content of the air with an increase in humidity is equal to the product of the surface temperature of the material by the specific heat of the liquid. If the surface of the moist material reaches the cooling limit, as is the case for the evaporation of water at high air velocities, there is a constant limiting cooling temperature. If alcohol is evaporated in air, an essentially higher temperature than the cooling limit obtains at the evaporating surface. In this case also, the change in condition of the air obeys the equation $di/dx = tc$. The actual change does not agree with the so-called "mixing line." Even if, in consequence of the small temperature differences, the Prandtl coefficients for heat transfer and evaporation of water and alcohol in air cannot be determined, the results show the applicability of the theory of similarities to the evaporation process. For the case of the evaporation of water in air, values have been found for the ratio of heat-transfer number to evaporation number in agreement with the law of Lewis. The tests with alcohol give values for this ratio which indicate that the specific heat of air is 2.15 times as great as it actually is. If the ratio of heat-transfer number to evaporation number and the course of the change in condition of the air are known, a simple equation may be used to estimate the surface temperature of the wet material. This ratio is equal to the ratio of the difference between humidity of the air at the surface of the wet material and that of the atmosphere to the difference between temperature of the atmosphere and the temperature of the surface of the wet material. W.H.H.

Furnace door. ANON. *Factory Management & Maintenance*, **100** [7] 142 (1942).—A newly patented refractory airtight furnace door is described. N.R.S.

High-speed rotational viscometer of wide range. Confirmation of the Reiner equation of flow. HENRY GREEN. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 576–85 (1942).—G. describes the use of a high-speed rotational viscometer for measuring pseudoplastic materials and thixotropic plastics. Data show the application of the Reiner equation for determining yield value and plastic viscosity, a term employed here for the reciprocal of mobility. Illustrated. F.G.H.

Hoisting apparatus in ceramic industries. PAUL DONNDORF. *Keram. Rundschau*, **46** [35] 392–94 (1938).—Chains and link structure, the strength of rope and the ratio of the diameter of the rope to that of the pulleys or drums, and other factors which determine the strength and performance of hoisting apparatus are discussed with a view to reducing work hazards. M.V.C.

Improved optical lever. P. W. CRIST. *Rev. Sci. Instruments*, **12** [4] 214 (1941).—The improved optical lever increases the angular rotation of the reflected beam by causing repeated reflection from the moving mirror. R.H.B.

Improved X-ray tube for diffraction analysis. R. R. MACHLETT. *Jour. Applied Physics*, **13**, 398–401 (1942).—The availability of malleable beryllium metal of high purity has made possible a new X-ray tube for diffraction analysis which affords much greater beam intensities, less inherent filtration, electrical and mechanical sturdiness, and shock-proof design. A.P.

Infrared absorption cell for volatile liquids. L. GILDART AND N. WRIGHT. *Rev. Sci. Instruments*, **12** [4] 204–205 (1941).—An absorption cell with rock salt windows has been designed for the infrared spectrographic analysis of volatile organic liquids. R.H.B.

Insulating concrete of high electric resistance and high dielectric strength. E. LAMBERT. *Bull. Soc. Franç. Élec.*, **10**, 257–63 (1940).—The concrete is made of cement, sand, or gravel and a special emulsion of bitumen (not specified). The excess water is driven off from the finished concrete by heating, and the pores are closed by the bitumen. The electric resistance of this perfectly refractory insulating concrete is greater than 10^6 megohms/cm./cm.^{2}; dielectric strength is greater than 10 kv. and under rain about 30% less. This product can be used for forming insulating pieces of complicated form, insulators, rail supports, etc. M.Ha.

Longer life from antifriction bearings. G. PALMGREN. *Factory Management & Maintenance*, **100** [7] 109–12 (1942).—P. explains the best methods for installing and removing bearings and discusses the effects of dirt, improper lubrication, misalignment, and improper loading on bearings. Some causes of corrosion, etching, and pitting and means of correction are given. N.R.S.

Mechanism of drying. WENDELL P. KEITH. *Ceram. Age*, **38** [1] 9–11 (1941).—Water is present in green clay products in many different forms: (1) water of plasticity, which is the water necessary to saturate the clay to the point where it becomes workable; (2) shrinkage water,

that portion of the water of plasticity that separates the grains and is responsible for shrinkage; (3) pore water, the water contained in the pores after the grains are in contact; (4) hydroscopic water, the water adsorbed to the surface of the pores or capillaries; and (5) chemically combined water, the water in chemical combination with the clay. As drying progresses, water is given off in the order named and at rates dependent upon the type of clay, its pore structure, and the amount of nonplastic materials as well as the conditions of time, temperature, and humidity. The drying rate is divided into two periods. In the first period the rate decreases at a constant rate controlled by and due to shrinkage. Beyond the "surface shrinkage limit" is the second period in which the rate rapidly decreases because of the increasing resistance of liquid and vapor diffusion to the surface. The moisture gradient between the surface and the interior is continuous, and the shrinkage also varies and develops strains that cause cracking when too great. To dry products safely, the rate of evaporation of moisture from the surface should not exceed the rate at which this moisture is diffused from the interior. The rate of diffusion depends almost entirely on the pore structure; by increasing it, therefore, the safe drying rate can be increased. This can be done by adding nonplastic materials, salts, and acids or by preheating the clay. All of these methods have been successful, but the method employed should be the one that best suits the circumstances. Air is the best drying medium, and by controlling it the temperature and rate of evaporation of water can be controlled. The wet-bulb temperature indicates this rate of evaporation, and, with the dry-bulb temperature, humidity and other information can be determined. By controlling the amount of water, the pore structure of the clay mass, and the wet- and dry-bulb temperatures, safe drying can more nearly be attained.
F.G.H.

Modern pH measurement technique. Superiority and limitations of the glass electrode. G. S. RANSHAW. *Ceram. Age*, **38** [6] 181–82 (1941).—R. compares the glass electrode with other types of electrodes from both the chemical and mechanical viewpoints. F.G.H.

Motor-driven ionization spectrometer. M. E. JEFFERSON AND S. B. HENDRICKS. *Rev. Sci. Instruments*, **12** [4] 199–203 (1941).—An ionization spectrometer giving high-intensity measurements is described; the coaxial rotation of the chamber and crystal is accomplished by precision ball bearings. Plans of the construction and pictures of the apparatus are instrumental for visual comprehension.
R.H.B.

Progress in the field of heavy chemical equipment: X, Granulation. BRUNO WAESER. *Chem. Fabrik*, **14** [2] 39–41 (1941).—For a given material, the specific work of milling is the least work required to increase the original surface by a unit area. Rittinger's law, that the work of granulation is proportional to the increase in surface, is assumed, but this gives no information as to how much energy is lost as heat. The limit of attainable fineness is reached sooner with materials of low specific gravity. To obtain the greatest fineness, the particles must strike the grinding organs with the greatest vertical component of velocity. W. quotes Büche in regard to wet grinding: "To get good action, a high viscosity of the paste is desirable. The increase in clearances due to stresses must be kept small by heavy construction. There may be great differences in the speeds of the different rolls. For a given material, however, there is a limit to the speed ratio of two rolls working together, and, if this limit is passed, there is a marked decrease in efficiency." According to Pronnitz ("Ball...," *Ceram. Abs.*, **16** [9] 281 (1937)), the drum of a ball mill used for wet grinding should be filled $^{7}/_{16}$ full with balls. When the material is held still and a portion of it is removed (as in cutting and splitting), the efficiency may approach 1%, but in processes considered in this article, the efficiency is more often below 0.1%. Milling, however, is not uneconomical. A consideration of the economy of methods of decreasing the size of particles must be based on the cost of the material pulverized in unit time. The success of mechanical pulverization, as compared with handwork, is due to the fact that the increase in output by machine is many times the loss in efficiency. Many new devices for breaking up materials into smaller particles which make use of jets of air or water, gravity, and centrifugal force have been proposed, as well as purely mechanical contrivances. Fifty-four German patents are listed. **XI, Drying.** *Chem. Fabrik*, **14** [4] 76–81 (1941).—The theory and practice of drying are discussed with reference to about 150 German patents. **XII, Sieving, sifting, sorting, centrifuging.** *Ibid.*, [8] 156–59.—With perforated plates for sieving, the free area is 20 to 40% of the total surface, and with woven sieves it is 30 to 70%. The fineness of perforated plates is expressed by the size of opening, and that of woven sieves by the number of meshes per unit area. Apart from handwork applied to dry materials, sorting is a wet process such as sedimentation, decanting, and elutriation. Flotation and magnetic separation are important with ores. The use of centrifuging for separating liquids from solids is well known. It may also be used to separate a gas from a liquid or one liquid from another. References are given to about 85 German patents. For Parts **III** and **IV** see *Ceram. Abs.*, **21** [6] 127 (1942). **Supplement to Parts I and II.** *Chem. Fabrik*, **14** [10] 196–98 (1941). W.H.H.

Progress in mechanizing conveyers. GUTMANN. *Glashütte*, **70** [19] 241–44 (1940).—Different types of conveyer belts and other apparatus for transporting ware and materials throughout the glass plant are briefly described. Illustrated. M.V.C.

Radiant heat in pottery drying. G. ALFRED HESS. *Ceram. Age*, **39** [1] 8–10, 17 (1942).—H. presents experimental results on the radiant-heat drying of heavy sanitary ware, fine and heavy china, and dust-pressed ware. Advantages and disadvantages are discussed, and possibilities for the future are suggested. Illustrated. F.G.H.

Radiation pyrometer. ANON. *Factory Management & Maintenance*, **100** [7] 140 (1942).—A newly patented pyrometer is discussed which is designed especially for recording the temperatures of moving objects and inaccessible objects and for use with temperatures out of the range of thermocouples. N.R.S.

Simple viscometer for research and control. FRANK C. CROXTON. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 593–95 (1942).—The viscometer described possesses the better features of other viscometers assembled into one through the adaptation of interchangeable ground joints. Rapidity is combined with rather low cost and accuracy equal to any of the accepted kinematic viscometers. A variation suitable for use with opaque liquids is presented. Illustrated. F.G.H.

Simplified dropping mercury electrode for polarographic analysis. R. C. MCREYNOLDS. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 586–87 (1942).—Details of construction and operation are given. Illustrated. F.G.H.

Tape viscometer, a new type of measuring device. F. WACHHOLTZ. *Chem. Fabrik*, **14** [8] 155 (1941).—A tape is pulled through a narrow clearance space filled with the material to be tested. If V is the velocity of the tape of width B, A is the width of the clearance space, and H is its height, then, according to Newton's law, the force, K, required to move the tape $= 2BH\frac{V}{A}\mu$, where μ is the viscosity in poises. The validity of this equation has been proved experimentally, but further tests are required to determine the most advantageous dimensions. W.H.H.

Temperature- and humidity-controlled drier for a chemical engineering laboratory. ROBERT M. SCHAFFNER AND JAMES COULL. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 590–92 (1942).—Details of construction and operation are given. Illustrated. F.G.H.

Transverse testing furnace. J. C. MCMULLEN. *Jour. Amer. Ceram. Soc.*, **25** [13] 389–90 (Sept., 1942).—2 figures.

BOOK

Design of High-Pressure Plant and Properties of Fluids at High Pressures. DUDLEY M. NEWITT. Oxford Uni-

versity Press, New York, 1940. Reviewed in *Rev. Sci. Instruments*, **12** [4] 224 (1941). R.H.B.

PATENTS

Apparatus for ceramic casting. W. F. MOONEY (Pacific Clay Products Co.). U. S. 2,294,476, Sept. 1, 1942 (March 22, 1941).

Centrifugal separator. H. O. LINDGREN (De Laval Separator Co.). U. S. 2,294,468, Sept. 1, 1942 (March 7, 1940).

Device for embossing the sides of ceramic pots. H. T. RITTER. U. S. 2,293,172, Aug. 18, 1942 (Aug. 3, 1939).

Electron image amplifier. P. T. FARNSWORTH (Farnsworth Television & Radio Corp.). U. S. 2,292,437, Aug. 11, 1942 (July 1, 1935).

Method and apparatus for manufacturing pottery ware. W. J. MILLER AND G. J. CRONINGER (W. J. Miller). U. S. 2,293,070, Aug. 18, 1942 (Nov. 15, 1939).

Preparation of drilling muds. A. D. GARRISON (Texas Co.). U. S. 2,292,267, Aug. 4, 1942 (July 7, 1937).—A drilling mud comprising a dispersion of clay in an aqueous solution of a water-soluble anhydrous composition in the form of a rapidly chilled melt comprising an alkali-metal oxide, P_2O_5, and B_2O_3, in which composition both P and B are present in appreciable amount and the alkali metal is present in an amount not to exceed the atomic equivalent of the sum of the atomic proportions of P and B and not less than one-half the equivalent of this sum, the B_2O_3 content of the rapidly chilled melt being within the range of 1 to 20% by weight.

Spray-coating machine. F. A. BAILEY (De Vilbiss Co.). U. S. 2,293,881, Aug. 25, 1942 (July 1, 1941).

Kilns, Furnaces, Fuels, and Combustion

Better utilization of coal. E. G. BAILEY. *Mech. Eng.*, **64** [4] 301–306 (1942).—B. reviews the progress toward the better utilization of coal resulting from the cooperation of the industrial user, the equipment manufacturer, the coal producer, many chemical and engineering laboratories, and the U. S. Bureau of Mines. F.G.H.

Calculation of flame temperatures. J. C. BREINL AND W. LENZ. *Z. Ver. Deut. Ing.*, **85** [11] 259–64 (1941).—The calculation of flame temperatures becomes inaccurate at temperatures above 1400°C., as the enthalpy (expressed in Cal. per m.³) at high temperatures must be corrected because of the dissociation under heat absorption of gases such as CO_2 and H_2O; the heat is liberated during cooling because of the recombination of the dissociated constituents. Ribaud developed a method of determining the temperature of combustion for any gas composition and for different degrees of dissociation which also permits the calculation of the enthalpy of combustion gases ("Apparent...," *Ceram. Abs.*, **17** [3] 112 (1938)). The basic equations (for 1 mole and the theoretical amount of air for combustion) are as follows: $C + O_2 + 3.76N_2 = CO_2 + 3.76N_2 + 96{,}600$ Cal.; $H_2 + 0.5O_2 + 1.88N_2 = H_2O + 1.88N_2 + 57{,}700$ Cal. The amount of heat produced, Q, gives the flame temperature according to the general equation $Q = [\Sigma m M c_{pm}](t_{fl} - t_0)$, where m = the mole number, M (kgm. per mole) = the molecular weight of the respective material, and c_{pm} (Cal. per kgm. °C.) = the mean specific heat between the air temperature, t_0, and the flame temperature, t_{fl}. The sum (Σ) is to be taken for all constituents so that $\Sigma m M c_{pm}$ (Cal. per °C.) represents the actual enthalpy of the gas mixture. For mixtures as given by the two basic equations, formula 3 becomes $96{,}600 = [44(c_{pm})_{CO_2} + 3.76 \times 28(c_{pm})_{N_2}](t_{fl} - t_0)$, and $57{,}700 = [18(c_{pm})_{H_2O} + 1.88 \times 28(c_{pm})_{N_2}](t_{fl} - t_0)$. If dissociation occurs, the following conditions prevail: $CO_2 = CO + 0.5O_2 - 68{,}200$ Cal., $H_2O = H_2 + 0.5O_2 - 57{,}700$ Cal., $H_2O = 0.5H_2 + OH - 64{,}000$ Cal., $H_2 = 2H - 100{,}700$ Cal., and $O_2 = 2O - 117{,}400$ Cal. These equations are used to calculate several tables of reaction constants, enthalpies as functions of combustion-gas temperatures, and curves for different gas mixtures, with and without excess air. A table gives the molecular heats for undissociating gases (H_2, O_2, CO, N_2) up to 3000°C. and for CO_2 and H_2O up to 1200°C. M.HA.

Methane–isobutane system. R. H. OLDS, B. H. SAGE, AND W. N. LACEY. *Ind. Eng. Chem.*, **34** [8] 1008–1013 (1942).—The volumetric and phase behavior of the methane–isobutane system was ascertained for pressures up to 5000 lb. per sq. in. in the temperature interval between 100° and 460°F. The study included the determination of the specific volumes of four mixtures, as functions of pressure and temperature, and the experimental measurement of the composition of the dew-point gas at three temperatures. The results were smoothed with respect to pressure and temperature, and the properties of the coexisting phases were ascertained for even values of these variables. Illustrated. F.G.H.

Natural gas in the U. S., its production, distribution, and utilization. W. B. POOR. *Mech. Eng.*, **64** [5] 369–72 (1942). F.G.H.

Prevention of defects in glazes by correctly built briquette-firing grates. J. GREWE. *Keram. Rundschau*, **49** [12] 121–23 (1941).—Defects in glazes fired in furnaces using (coal) briquettes are caused by a too-oxidizing or too-reducing atmosphere, according to the state of combustion of the briquettes, and by cold air entering through the grate if the fuel has burned away too much. Fine ash can also contribute to defects in the glaze. G. describes the correct arrangement of a grate for briquettes to produce uniform combustion; the principles of boiler firing are applied. M.HA.

Principal function of pulverized-coal burners. HENRY KREISINGER AND V. Z. CARACRISTI. *Mech. Eng.*, **64** [5] 365–68 (1942).—The principal function of pulverized-coal burners is to distribute fuel and air evenly in a furnace. The vertical, horizontal, and tangential methods of firing are considered. Illustrated. F.G.H.

Tunnel-kiln operations. L. A. MARTIN. *Ceram. Age*, **38** [2] 40–41, 47 (1941).—Details of the operation of several tunnel kilns firing a variety of products are presented. F.G.H.

Viscosity of propane, butane, and isobutane. M. R. LIPKIN, J. A. DAVISON, AND S. S. KURTZ, JR. *Ind. Eng. Chem.*, **34** [8] 976–78 (1942).—Illustrated. F.G.H.

BOOK

Smoke Abatement. L. V. BRIGGS. Old Corner Book Store, Boston, 1941. 175 pp. Price $2.50. Reviewed in *Mech. Eng.*, **64** [3] 237 (1942).—The efforts made by various cities to establish control of the smoke problem are presented, and the serious effects of smoke on health, plant life, and property are described. Quotations and excerpts from many sources are included. The last chapter indicates briefly what is being done abroad. F.G.H.

PATENTS

Electrically heated kilns. B. J. MOORE AND B. C. MOORE. Brit. 546,449, July 29, 1942 (July 3, 1941).

Kiln control. S. T. SCHWARTZ (Babcock & Wilcox Co.). U. S. 2,292,243, Aug. 4, 1942 (Oct. 1, 1940).

Geology

Bulgarian kaolins. K. WOYNOFF. *Keram. Rundschau*, **46** [41] 486–87 (1938).—Large deposits of kaolin have been found in Bulgaria, the most important being near the town of Boschidar not far from the town of Novi Pazar. The chemical and rational analyses of raw kaolins and washed kaolins are tabulated. The washing process improves the properties of the raw kaolin and produces ware of higher quality. M.V.C.

Classification of serpentine minerals by thermal analysis. N. E. EFREMOV. *Compt. Rend. Acad. Sci. U.R.S.S.*, **28** [5] 441–44 (1940); *Khim. Referat. Zhur.*, **4** [2] 30 (1941).—An investigation of serpentine minerals by thermal analysis showed that all the investigated chrysotiles and chrysotile asbestos of the Caucasus and the Ural have an exothermal stop at 810° and an endothermal stop at 600° to 700°. A study of the serpentine minerals saponite, boulingite, and a group of serpophites showed that the extent of their exothermal effect depends on their nature; in the colloidal varieties the effect is absent, while in the colloid-crystalloid and crystalloid varieties it appears frequently. The magnitude of the exothermal effect is a result of the recrystallization of gel in the serpentine substance. In the chrysotile asbestos it is small; in bastites, cermatites, and switzerites it attains a maximum.
M.Ho.

Crystal lattice models based on the close packing of spheres. A. L. PATTERSON. *Rev. Sci. Instruments*, **12** [4] 206–11 (1941).—An extensive investigation of the close packing of spheres is presented; the Langmuir and Nelson box representation is used in the explanation.
R.H.B.

Determination of optical crystallographic properties of crystalline cut precious stones. W. PLATO. *Z. Wiss. Mikroskopie*, **57** [2] 137–52 (1940); abstracted in *Physik. Ber.*, **22** [1] 53 (1941).—When precious stones cannot be sufficiently identified and classified by determining their color, hardness, density, refractive index, and other general properties, optical crystallographic data must be determined, e.g., optical uniaxial or biaxial property, optically positive or negative character, angle between axes, circular polarization, etc. P. describes an apparatus consisting of a small microscope, a polarization device, and a rotating table for the stones for making such determinations in a simple manner. The individual parts of the apparatus are described.
M.Ha.

Electrophoretic filtration of a kaolin slurry. O. C. RALSTON AND M. HOSEH. *Trans. Electrochem. Soc.*, **80**, 85–94 (1941).—Electrophoretic deposition of an Alabama kaolin was investigated, using several times the voltage commonly used in Europe for commercial dewatering of washed clay slips, to obtain data on behavior at bath potentials higher than those described in the literature. The moisture content of the deposit decreases with the amount of energy passed through the bath and hence with time of deposition and with voltage and density of current applied. The yield of clay is about the same per ampere-hour or per faraday of electricity, irrespective of the voltage used on the bath. Yield per kilowatt-hour therefore decreases with rise in voltage. The apparent electrochemical equivalent of this clay was about 10,000 gm. per faraday, equivalent to 38 to 40 gm.-formula weights per faraday. Anomalous bath resistances were noted, bath resistance tending to decrease with advance in the electrophoresis instead of increasing with depletion of suspension and increased dryness of the anodic deposit of clay. Illustrated.
F.G.H.

Evacuation method of determining absorptions. W. D. SPORE. *Ceram. Age*, **39** [2] 44–45 (1942).—The evacuation method of determining absorptions is fast and efficient. The differences between the evacuation and boiling methods are controlled by the following factors: (1) type of body or, probably more accurately, the type of pores formed by a particular body formula; (2) size and thickness of the ware; the larger and thicker the ware, the greater are the differences between the boiling and evacuation methods; and (3) porosity of the ware; the more porous the ware, the smaller is the difference between the boiling and evacuation methods.
F.G.H.

Experiments on heating minerals at pressures up to 100 atmospheres. M. P. VOLAROVICH. *Trudy Mineralogii & Petrografii, Inst. Geol. Nauk, Akad. Nauk*, **1940**, 45–54; *Khim. Referat. Zhur.*, **4** [2] 3 (1941).—A specially constructed apparatus for heating minerals at pressures over 1000 kgm. per sq. cm. and up to 1100° is described. With this furnace a comparative study was made of minerals heated at high temperatures and high pressures and at atmospheric pressure at similar temperatures. Extrusion minerals do not change appreciably either at atmospheric or at high pressures. Sedimentary minerals change their physicomechanical properties, more at high pressures than at atmospheric pressure. The following minerals were investigated: rhodochrosite, acmite, siderite, and various zeolites. At high pressures, rhodochrosite changes its color, oxidizes, and transforms into pyrolusite. The zeolites (natrolite, analcite, vishnevite) change their microstructure and their physical properties sharply at high pressures and temperatures. Experiments were also made on the dehydration of zeolites at high temperatures. The refractive index of the heated minerals was slightly lower at normal pressure, and it increased at higher pressures. The low index can be explained by the occlusion of air bubbles and the higher index by an increased density.
M.Ho.

Heat of formation of dioptase. W. A. ROTH, GERHILDE WIRTHS, AND HILDEGARD BERENDT. *Zentr. Mineral. Geol.*, **1940A**, No. 11, pp. 225–27; abstracted in *Physik. Ber.*, **22** [3] 269 (1941).—Dioptase is a silicate of the form $Cu_3Si_3O_9 \cdot 3H_2O$. Its heat of formation is +5.3 Cal. per mole, while that of the water-free dioptase is −13 Cal. The heat of hydration is therefore 18.3 Cal., which is considerably smaller than that of all other silicates investigated. The heat of formation of the anhydrous silicate is one of the few known negative heats of formation.
M.Ha.

Increasing the filtering speed by modifying the slip. HORST RUMPELT. *Chem. Fabrik*, **13** [26] 481–83 (1940).—Tests have shown that the filtering ability of a slip may be economically improved by the addition of sensitizers without injuring the final product; e.g., by adding 50 gm. *konjaku* meal per ton of solid, an improvement of 50 to 300% can be obtained in many cases. *Konjaku* meal is prepared from devil's-tongue, a starchy plant with a tuberous root, often used in Japan for food (see Petersen, *Ber. Deut. Keram. Ges.*, **16**, 252–76 (1935); **18** [7] 299–308 (1937)). A considerable decrease in the filter surfaces is also possible. A comparison of different sensitizers in regard to the amount required shows that *konjaku* meal is superior. The best addition is about $^1/_4$ or $^1/_5$ the quantity of starch or gelatin. Even the practically impossible temperature of 80°C. with a cement raw mix does not give the increased output obtained by an addition of 0.001% of the sensitizer.
W.H.H.

Industrial utilization of selenium and tellurium. G. R. WAITKINS, A. E. BEARSE, AND R. SHUTT. *Ind. Eng. Chem.*, **34** [8] 899–910 (1942).—The commercial availability of selenium and tellurium has led to the development of new applications for them during recent years. They are being used in the chemical, electrical, ceramic, and metallurgical industries in ever-increasing amounts. Selenium is employed in the manufacture of pigments, in the compounding of rubber, in the manufacture of rectifiers, as a decolorizer for glass, and as an alloying element to improve the machinability of copper alloys and stainless steel. Tellurium is used to improve the physical properties of rubber, lead, and cast iron. Many developments now in an experimental stage may soon attain commercial importance. Other recent developments connected with the war effort cannot be discussed at present. In view of the increased production and commercial utilization of selenium and tellurium, a brief discussion of toxicity is included. Illustrated.
F.G.H.

Study of ceramic materials in the mining schools of the U. S. A. F. GREAVES-WALKER. *Bull. Amer. Ceram. Soc.*, **21** [8] 167 (1942).

Titanous vesuvianites from Perovskitov and Akhmatov mines in the southern Urals. V. S. MIASNIKOV. *Compt. Rend. Acad. Sci. U.R.S.S.*, **28** [5] 445–48 (1940); *Khim. Referat. Zhur.*, **4** [2] 31 (1941).—The Ti vesuvianites from these mines contain 4 to 4.5% TiO_2. They are found in cracks of chlorite-pyroxene and chlorite-granite rocks, in limestones, close to amphibolites. The crystals of Ti vesuvianites are dark brown and poorly formed; they attain a length of 5 to 6 cm. and a width of 3 cm. Their indices of refraction are 1.742 and 1.736, higher than those

of normal vesuvianites. In other respects they do not differ from ordinary vesuvianites. M.Ho.

Ural kaolins for the paper industry. B. M. KARASIK. *Bumazhnaya Prom.*, **1940**, No. 9, pp. 11–15; *Khim. Referat. Zhur.*, **4** [2] 32 (1941). M.Ho.

SEPARATE PUBLICATIONS

Chrome Industry in India. ANON. *Geol. Survey India Bull.;* reviewed in *Metallurgia*, **24**, 129 (1941).—Present practice and possibilities for the development of a chrome industry in India are described. E.C.P.

Crayons, Chalks, Modeling Clays, etc. (for School Use). ANON. *Nat. Bur. Standards Simplified Practice Recommendation*, R192–42. 3 pp.—This recommendation is effective from May 15, 1942. R.A.H.

Development of Lightweight Concretes from North Carolina Vermiculites. W. A. SCHOLES, A. F. GREAVES-WALKER, E. R. TODD, AND D. F. COX. *N. C. State Coll. Eng. Expt. Sta. Bull.*, No. 24, 70 pp. (1942).—A brief discussion and review of the origin, occurrence, production, methods of processing, and uses of vermiculite are presented. An investigation of the factors affecting the expansibility of North Carolina vermiculites led to the following conclusions: (1) For maximum expansion, North Carolina vermiculites should be subjected suddenly to a temperature of approximately 1840°F. for a short time. (2) To obtain the most desirable golden color, the material should be expanded at 1840°F. or above in an oxidizing atmosphere. (3) To produce a maximum of silver-colored material, the vermiculites should be expanded under reducing conditions. (4) Preliminary drying to a constant weight at 110°C. does not improve their expansibility. (5) Wetting of the vermiculite before expansion does not aid in producing maximum exfoliation. (6) Maximum toughness is obtained by exfoliating the material at temperatures below 1900°F. (7) Exfoliation at high temperatures under reducing conditions produces the weakest material and also slightly reduces the amount of expansion. (8) After expansion, all the North Carolina vermiculites tested were comparatively brittle and broke down to some extent when handled. The brittleness, however, was not such as to limit their use as "loose fill" and as aggregate in concretes. P.S.D.

Feldspar in Illinois Sands. H. B. WILLMAN. *Illinois State Geol. Survey Rept. Investigations*, No. 79, 87 pp. (1942).—Extensive deposits of sand in Illinois contain 20% feldspar, and some deposits contain more than 30%. No feldspar is mined in the State or in the Middle West, but considerable tonnages are shipped in from such distant states as Colorado, North Dakota, and North Carolina. Feldspar might be produced profitably from Illinois sands if an economical process for separating feldspar of commercial grade from the sand can be developed. The fact that feldspar can be separated from crushed granite by flotation suggests that it possibly can be separated from the Illinois sands. An investigation was undertaken by the Illinois Geological Survey to determine (1) the extent and nature of the feldspar-bearing sands, and (2) the most economical methods of separating and preparing commercial grades of feldspar from them. This report covering the first portion of the investigation describes the distribution and size of Illinois sand deposits and gives the results of sieve and mineral analyses of more than a hundred samples representing typical deposits throughout the State. Enormous deposits of feldspar-bearing sands occur, especially in the northern and western parts. Much of the feldspar-bearing sand has little or no present commercial use. The types of materials investigated were dune sands, glacial outwash sand and gravel, river sand, lake and beach sand, preglacial sand, and sands produced by crushing sandstones. The sandstones and preglacial sands contain comparatively little feldspar, but the other types commonly contain 15 to 25% feldspar. Data regarding the percentage of feldspar in the different types of sand are summarized, and Illinois sand deposits are classified on the basis of grain size and carbonate content. The possible advantages and disadvantages of the sands as sources of feldspar are summarized. G.A.K.

PATENT

Purification of zirconium compounds. EUGENE WAINER. (Titanium Alloy Mfg. Co.). U. S. 2,294,431, Sept. 1, 1942 (July 31, 1941).—The method of purifying crude zirconium compounds or ores comprising preparing a crude aqueous mixture containing zirconyl ions, sulfate ions, and ions of an acid, other than sulfuric, which has a lower boiling or decomposition point than sulfuric acid and which does not form insoluble precipitates with zirconium compounds, the proportion of zirconyl ions to sulfate ions being between 2 to 3 and 4 to 1, and the concentration of zirconyl ions being such that the zirconium dioxide content is between 100 and 400 gm. per liter of liquor, evaporating the mixture to dryness at a temperature between 90° and 850°C. to form a precipitate of insoluble zirconium oxysulfate, leaching to dissolve impurities, and separating the precipitate from the dissolved impurities.

Chemistry and Physics

Behavior of minerals and synthetic compounds of the system R_2O–SiO_2–Al_2O_3 on calcination with $CaCO_3$. F. N. STROKOV, V. A. MUSIAKOV, AND V. S. VOLKOV. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940**, No. 32, pp. 72–78; *Khim. Referat. Zhur.*, **4** [1] 106–107 (1941).—Compounds belonging to the system R_2O–SiO_2–Al_2O_3, i.e., that of nepheline, were investigated. By their behavior on calcination with $CaCO_3$ and their subsequent extraction with an acid or a base, the admissibility of their presence in standard nepheline-lime calcination products can be judged. The calcination of various minerals, such as albite, orthoclase, etc., with $CaCO_3$ in the molar ratio $CaO:SiO_2 = 2$ permits the extraction from them of up to 90% Al_2O_3 and R_2O. In a nepheline-lime calcination of $CaO:SiO_2 = 2$, glasses of the type investigated cannot be found. This is explained by the fact that nepheline does not contain compounds of the jadeite and albite types. The alkali aluminates of this system give solid solutions with SiO_2. M.Ho.

Compounds formed within the limits of the system Na_2O–CaO–Al_2O_3 on calcination and their behavior under hydrochemical treatment. F. N. STROKOV, V. A. MUSIAKOV, AND V. S. VOLKOV. *Sbornik Rabot Gosudarst. Inst. Priklad. Khim.*, **1940**, No. 32, pp. 49–54; *Khim. Referat. Zhur.*, **4** [1] 106 (1941).—On the basis of numerous experiments on various compositions within this system, it can be concluded that $8CaO \cdot Na_2O \cdot 3Al_2O_3$ cannot be successfully leached with water and that $3CaO \cdot Na_2O \cdot 5Al_2O_3$, yielding up to 80% of Na_2O and up to 28% of Al_2O_3, cannot be present in nepheline-lime calcination products because of the difficulty of their formation. A study of the interaction of Na_2O and CaO with Al_2O_3 showed that Na_2O has a great affinity; therefore, when nepheline and lime are calcined in the presence of a sufficient amount of Na_2O ($R_2O:Al_2O_3 = 1$), Na aluminate is formed. When the ratio is less than 1, Ca aluminates are formed. The extraction of Al_2O_3 is more effective with Na_2CO_3 + NaOH (up to 96%) than with a solution of NaOH (up to 82%). M.Ho.

Detection of orthophosphates by means of drop reactions. PHILIP W. WEST AND THOMAS HOUTMAN. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 597–99 (1942).—Many methods for detecting or determining orthophosphates have been reported in the literature, but little has been published concerning their detection by means of drop reactions. In the work that has been reported, the studies of interferences have often been incomplete and there is little agreement between the results of various investigators. To evaluate the more promising reactions, comparative data concerning interferences and sensitivities

were obtained. After an extensive survey of the literature, the strychnine molybdate, ammonium molybdate-stannous chloride, and ammonium molybdate-benzidine tests were selected for study. A modified strychnine molybdate test devised by the authors is given. F.G.H.

Determination of active silicic acid in hydraulic admixtures. A. L. Vorob'ev and P. L. Prikhod'ko. *Zavodskaya Lab.*, **9** [5-6] 630-31 (1940); *Khim. Referat. Zhur.*, **4** [1] 79 (1941).—In determining SiO_2 in hydraulic admixtures according to OST 6192/219 (official Russian method), the separated SiO_2 is contaminated with Al_2O_3 and Fe_2O_3. The fuming of the SiO_2 with HF and H_2SO_4 is therefore suggested. The SiO_2 contaminated with extraneous matter amounts to 30% of the total SiO_2. M.Ho.

Determination of fluorine in mineral borates. E. N. Egorova. *Byull. Inst. Halurgiĭ*, **1939,** No. 12, pp. 17-18; *Khim. Referat. Zhur.*, **4** [2] 60 (1941).—F in mineral borates was determined by the method of Beer and Bazart as modified by M. V. Levenfish (private communication). A comparison of this method with the Berzelius method gave differences of a few hundredths of 1% for samples containing approximately 1% F. The content of F in the mineral borates varied from 0.05 to 0.30%. Most of the F was attributed to impurities contaminating the borates. M.Ho.

Determination of sodium and potassium ions. M. B. Shchigol. *Zavodskaya Lab.*, **9** [7] 791 (1940); *Khim. Referat. Zhur.*, **4** [2] 59 (1941).—The interfering cations are precipitated with $(NH_4)_3PO_4$ in an ammoniacal solution. The excess phosphate ion is precipitated with a saturated solution of $BaCl_2$. The excess of the latter is precipitated in an ammoniacal solution with $(NH_4)_2CO_3$. After each precipitation, the precipitate is centrifuged. The final solution is evaporated, ignited, and dissolved in hot water, and the alkalis are determined as usual. M.Ho.

Development of the sodium silicate (water glass) industry. E. S. Steblin. *Prom. Stroitel. Materialov*, **1940,** No. 9, pp. 61-63; *Khim. Referat. Zhur.*, **4** [2] 85 (1941). M.Ho.

Direct determination of sulfur. G. L. Mack and J. M. Hamilton. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 604-606 (1942).—An ammoniacal cuprous sulfate reagent is prepared by reducing a solution of cupric ammonium sulfate with hydroxylamine hydrochloride. The reaction of this reagent upon elemental sulfur in acetone solution to form colloidal cuprous sulfide has been made the basis of a turbidimetric method for the direct determination of sulfur. The reagent was found to be capable of detecting 1 μgm. of sulfur in 10 ml. of solution. The determination is fairly specific and accurate. The rapidity with which a large number of samples can be analyzed makes it especially useful for routine work. F.G.H.

Electrochemical properties of mineral membranes: V, Beidellite membranes and the determination of sodium. C. E. Marshall and C. A. Krinbill. *Jour. Amer. Chem. Soc.*, **64** [8] 1814-19 (1942).—Clay membranes have been prepared which are sensitive only to monovalent cations (H-montmorillonite 490°C.), to monovalent and divalent cations (H-montmorillonite 350°C.), and to mono-, di-, and tri-valent cations (H-beidellite 600°C.). For sodium estimations, beidellite membranes gave excellent reproducibility. The potentials obtained with solutions less concentrated than 0.03 *N* were within 1 mv. of those calculated using the Nernst equation. Sodium chloride, sulfate, and ferrocyanide gave practically the theoretical potentials, whereas low values were obtained with sodium citrate. This is ascribed to complex formation. The behavior of mixtures of cations can be predicted, and the mobility ratios of the cations within the clay membranes have been determined experimentally in certain cases. Using these values, the experimental and theoretical potentials for mixtures of cations are found to be in good agreement. Illustrated. F.G.H.

Electrooptical properties of colloids. H. Mueller and B. W. Sakmann. *Jour. Optical Soc. Amer.*, **32,** 309-17 (1942).—Certain colloids, especially bentonite, exhibit electrooptical and magnetooptical effects of extremely large magnitudes varying with the intensity and frequency of the applied field and the concentration of the sols. A study of these effects promises to furnish new information about size and shape and eventually about the forces acting between the micelles. This paper is limited to discussion and description of the experimental method. See *Ceram. Abs.*, **20** [7] 178 (1941). A.P.

Equation for the isotherms of pure substances at their critical temperatures. Cyril H. Meyers. *Jour. Research Nat. Bur. Standards*, **29** [2] 157-76 (1942); RP 1493. Price 10¢. R.A.H.

Estimation of ortho-, pyro-, meta-, and poly-phosphates in the presence of one another. Loren T. Jones. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 536-42 (1942).—Procedures for the estimation of ortho-, pyro-, hexameta-, trimeta-, and poly-phosphates have been developed. Hexametaphosphate is separated as barium hexametaphosphate in an acid solution, and pyrophosphate is precipitated as manganous pyrophosphate at pH 4.1 in the presence of a small amount of acetone after removal of the hexametaphosphate radical. Orthophosphate is precipitated in the cold filtrate after removal of barium phosphates from a solution just acid to methyl red. Trimetaphosphate is obtained in the filtrate from an alkaline precipitation of all other phosphates as their barium salts. Total phosphorus pentoxide is determined so that polyphosphates may be obtained by difference. A qualitative test for identifying the polyphosphate as tetraphosphate is given. Alkalinity is determined by a standard acid titration to phenolphthalein and bromocresol green indicators to aid in calculating the probable form in which the phosphates may be present. Data are given on the application of the method to the analysis of samples of glassy metaphosphate, tetra- and tri-polyphosphates, and synthetic mixtures of phosphates, carbonates, and silicates, as well as unknowns of these substances. F.G.H.

Experimental study of the absolute temperature scale: VIII, Thermal expansion and compressibility of vitreous silica and the thermal dilatation of mercury. J. A. Beattie, B. E. Blaisdell, J. Kaye, H. T. Gerry, and C. A. Johnson. *Proc. Amer. Acad. Arts & Sciences*, **74** [11] 371-88 (1941); abstracted in *Science Abs.-A*, **45** [534] 163 (1942).—Values of the following properties are tabulated for Hg from 0° to 350°C.: the true and mean coefficients of thermal dilatation, the density and specific volume, and the ratio of the densities at $t°$ and at 0°C. For vitreous silica the true and mean coefficients of linear thermal expansion and of thermal dilatation at temperatures of 150° to 450°C. are tabulated. H.K.R.

Fractionation of colloidal systems. Selection of operating conditions for the supercentrifuge. George Fancher, S. C. Oliphant, and C. R. Houssiere, Jr. *Ind. Eng. Chem., Anal. Ed.*, **14** [7] 552-54 (1942).—Illustrated. F.G.H.

Habit and orientation in electron diffraction. R. P. Johnson and W. R. Grams. *Phys. Rev.*, **62** [1-2] 77-79 (1942).—Electron diffraction patterns of etched tungsten surfaces apparently indicate a preferred orientation of the crystallites, with (100) ⊥ surface. Actually, the etching leaves, on grains of certain orientation, a structure exceptionally favorable for diffraction, and these selected grains dominate in the scattering. Analogous examples of weighted sampling appear in studies of clay and graphite. It is suggested that crystal habit may frequently replace orientation as the cause of arcing in reflection patterns. G.A.K.

Heat capacities of red and yellow lead monoxides at high temperatures. Hugh M. Spencer and W. Monroe Spicer. *Jour. Amer. Chem. Soc.*, **64** [3] 617-21 (1942).—The construction of an aneroid calorimeter of the type used by Jaeger and his co-workers is described. The heat contents of yellow and red lead monoxides were measured between 25°C. and 400° to 650°C. and 400° to 550°C., respectively. Equations expressing the heat capacities of the red and yellow lead monoxides are derived. Illustrated. F.G.H.

Heat of formation and high-temperature heat content of manganous oxide and manganous sulfate. High-tem-

perature heat content of manganese. J. C. SOUTHARD AND C. HOWARD SHOMATE. *Jour. Amer. Chem. Soc.*, **64** [8] 1770–74 (1942).—The heat of formation of manganous oxide has been determined to be $-92{,}040 \pm 100$ cal. per g.f.w. and that of manganous sulfate to be $-254{,}180 \pm 250$ cal. per g.f.w. at 25°C. The heat contents of manganese, manganous oxide, and manganous sulfate from room temperature to temperatures between 811° and 1500°C. were determined. These observations disclosed a transition in manganese at 739°C. A table summarizing increments of heat contents, entropies, and free energies at 100° intervals has been prepared from these data and others in the literature. F.G.H.

High-temperature heat content of Mn_3O_4, $MnSiO_3$, and Mn_3C. J. C. SOUTHARD AND G. E. MOORE. *Jour. Amer. Chem. Soc.*, **64** [8] 1769–70 (1942).—The heat contents of Mn_3O_4, $MnSiO_3$, and Mn_3C were determined from room temperature to temperatures between 1140° and 1500°C. These determinations disclosed transitions of Mn_3O_4 at 1172°C. and of Mn_3C at 1037°C. A table summarizes the increments in the heat contents and entropies of these substances above room temperature at 100° intervals. F.G.H.

Hydrogel of zirconia: I, Time of set. CHARLES B. HURD, WALTER A. FALLON, AND ROBERT W. HOBDAY. *Jour. Amer. Chem. Soc.*, **64** [1] 110–14 (1942).—Hydrogels of zirconia were prepared by mixing solutions of sodium carbonate or sodium acetate and zirconium oxychloride. This raised the pH of the latter solution from 0.1, where it does not set, up to values of 2.0 to 5.0. The time of set was found in terms of temperature, pH, and concentration of added electrolyte. The energy of activation varied from 21,000 to 29,000 cal. The gels are softer than corresponding silicic acid gels and show some syneresis but do not hold their form. Gels which formed at 25°C. in a few minutes were found to reliquefy at constant temperature in a few hours. Raising the temperature to 60°C. caused regelation, and subsequent cooling caused reliquefaction. The process may be repeated. The time of set is very much decreased by adding potassium chloride, in low concentrations, to the mixture. A theory for the setting process involving condensation of zirconyl hydroxide is suggested. The amphoteric nature of zirconyl hydroxide makes this possible. F.G.H.

Lead oxides: VI, Effect of grinding on the X-ray diffraction patterns of mixtures containing lead oxides. GEORGE L. CLARK AND STANLEY F. KERN. *Jour. Amer. Chem. Soc.*, **64** [7] 1637–41 (1942).—The grinding of mixtures of PbO_2 with either *R*-PbO (red, tetragonal) or *Y*-PbO (yellow, orthorhombic) results in the disappearance of the X-ray diffraction lines characteristic of PbO. This is not the case when PbO is ground with an abrasive such as silicon dioxide. Active oxygen analysis on the samples before and after grinding showed that there was no increase in oxygen content in the mixture during grinding and, consequently, no oxidation of the PbO to PbO_2. The formation of a solid solution of PbO in PbO_2 or compound formation between them is improbable, as the PbO is easily extracted from the ground mixture with sulfamic acid, no new lines indicative of compound formation are present on the pattern, and, on annealing the ground sample, the PbO is restored to normal *R*-PbO. There is an abnormally high absorption of carbon dioxide by the PbO when ground with PbO_2. The absorption of carbon dioxide is not necessarily the cause of the disappearance of the PbO pattern, as the PbO lines do not appear on patterns of samples ground in a vacuum and containing less than 0.1% carbon dioxide. The high absorption of carbon dioxide by the mixture when ground in air is further evidence of the increased activity of PbO when formed in the distorted form. Lead oxide loses its diffracting power when ground with other compounds, such as lead sulfate, although these are not so effective as PbO_2. The grinding of mixtures of lead iodide and PbO results in the disappearance of the pattern of the lead iodide while the PbO pattern remains. The lead iodide acts as a lubricant and thereby protects the PbO from distortion. This lubricating action of the lead iodide arises from the weak forces existing between layers of iodide ions in the lead iodide crystals. For Part II see *Ceram. Abs.*, **18** [9] 255 (1939). F.G.H.

Solubility of nickel oxide in silicates and alumino-silicates. N. L. DILAKTORSKIĬ. *Trudy Mineralogiĭ & Petrografiĭ, Inst. Geol. Nauk, Akad. Nauk*, **1940**, 79–82; *Khim. Referat. Zhur.*, **4** [2] 26 (1941).—In a study of anhydrous Ni-containing silicates, the solubility of nickel metasilicate in clinoenstatite was investigated. A fusion containing 10 to 50% $NiSiO_3$ showed that its content of $MgSiO_3$ does not exceed 10 to 15%. Olivines crystallized out from the melts. In analogous experiments with diopside and $NiSiO_3$, Ni pyroxene, Mg-Ni olivine, and SiO_2 crystallized out. The refractive indices of meta- and ortho-silicates of the system $CaMgSi_2O_6$–$NiSiO_3$ were determined. The composition of Mg-Ni olivine was determined. A study was made of the solubility of NiO in anorthite; the formation of a simple eutectic with the separation of pure anorthite was observed, but no dissolution of NiO in anorthite took place. M.Ho.

Surface compounds and chemical reactions on surfaces. L. K. LEPIN. *Uspekhi Khim.*, **9** [5] 533–49 (1940); *Khim. Referat. Zhur.*, **4** [1] 27 (1941).—Sorption phenomena which occur at the interface are divided into two groups: molecular (Van der Waals') adsorption and chemical surface reactions. The latter are distinguished from ordinary heterogeneous reactions by the fact that the resulting compounds do not form a separate phase, as the atoms entering into such reactions do not sever their ties with the atoms forming the crystalline lattice of the solid matter. In elementary bodies the most likely to form surface compounds are those with low atomic volume. Analyzing the curve of atomic volumes, L. concludes that surface compounds may be expected in C, Si, Al, the elements of the VIII periodic group, and elements near them. The surface oxides of C are discussed. The three structural formulas of these oxides as proposed by N. A. Shilov are quoted. The adsorption of electrolytes by C oxides is regarded as a double exchange between the surface oxide and the electrolyte. M.Ho.

Surface energy relations in liquid–solid systems: I, Adhesion of liquids to solids and a new method of determining the surface tension of liquids. G. MACDOUGALL AND C. OCKRENT. *Proc. Roy. Soc.* [London], **180A**, 151–73 (1942).—A new method for determining the surface tension of liquids involves consideration of the advancing and receding contact angles of a liquid drop on a tilted solid surface. The difference between the adhesions corresponding to the advancing and receding angles is ascribed to the work done in removing an adsorbed unimolecular layer. The forces involved are short-range Van der Waals. Monolayers of ferric stearate on glass are oriented with their hydrocarbon tails away from the interface in agreement with electron diffraction measurements. A.P.

System of photometric concepts. PARRY MOON. *Jour. Optical Soc. Amer.*, **32**, 348–62 (1942).—M. presents a comprehensive system of concepts, names, and units associated with the geometric relations that occur in radiometry and photometry. Six generalized concepts are required, although the first two or three suffice for most calculations. Old names, such as illumination, brightness, and intensity, are scrapped for scientific usage. Units are simplified and brought into the m.k.s. system. The final system is closely related to the rest of physics and is applicable to diffusing or scattering media, volume or surface sources. A.P.

Theory of finite deformations of elastic crystals. R. FÜRTH. *Proc. Roy. Soc.* [London], **180A**, 285–304 (1942).—The general theory of the finite deformation of cubic crystals at zero temperature is developed and interpreted with reference to the forces between particles in the lattice. A.P.

Volumetric method of determining magnesium oxide in calcined magnesia. I. T. TARANENKO. *Zavodskaya Lab.*, **9** [7] 788 (1940); *Khim. Referat. Zhur.*, **4** [2] 59 (1941).—Magnesia (0.3 to 0.5 gm.) is dissolved by shaking in 50 ml. of cold 0.5 *N* HCl. After the dissolution, the excess acid is titrated with 0.5 *N* NaOH to methyl orange. The results of titration are calculated in terms of MgO.

The CaO content is disregarded. The time required is 20 to 30 min. The results approximate those obtained gravimetrically. M.Ho.

X-ray diffraction examination of material having the composition SiO. H. N. BAUMANN, JR. *Trans. Electrochem. Soc.*, **80**, 95–98 (1941).—In 1905, F. J. Tone prepared a brown solid in the electric furnace. On the basis of chemical analysis he concluded that the product was a mixture of silicon and silica but not the compound SiO. This conclusion is now confirmed on the basis of X-ray diffraction data. The prevailing lines are those of silicon and cristobalite. The existence of SiO is therefore very doubtful; it may be stable at high temperatures and break down on cooling. F.G.H.

BOOKS

Applied X Rays. G. L. CLARK. McGraw-Hill Book Co., New York, 1940. 3d ed. 674 pp. Price $6.00. Reviewed in *Rev. Sci. Instruments*, **12** [4] 221 (1941).—This book is recommended to those who wish to obtain a general picture of the application of X rays in various fields. R.H.B.

Physical Chemistry of High Polymeric Systems. H. MARK. Interscience Publishers, Inc., New York, 1940. 345 pp. Price $6.50. Reviewed in *Rev. Sci. Instruments*, **12** [4] 221 (1941). R.H.B.

PATENTS

Manufacture of coated particles. J. D. CARTER (Philadelphia Quartz Co.). U. S. 2,292,199, Aug. 4, 1942 (Jan. 16, 1940).

Manufacture of silicate-anhydrite compositions. J. D. CARTER (Philadelphia Quartz Co.). U. S. 2,292,198, Aug. 4, 1942 (Dec. 29, 1936; Oct. 30, 1939).—In the process of manufacturing chemically setting silicate-anhydrite compositions, the steps which comprise treating finely divided anhydrite particles with a solution of an alkali-metal silicate under conditions producing the formation of a superficial siliceous gel coating on the anhydrite particles without any substantial setting taking place and recovering the gel-coated particles from the solution while still reactive with solutions of alkali-metal silicates.

Manufacture of titanium dioxide. M. J. BROOKS (General Chemical Co.). U. S. 2,292,507, Aug. 11, 1942 (March 29, 1940).

Production of composite titanium oxide pigments. H. M. STARK (E. I. du Pont de Nemours & Co.). U. S. 2,293,861, Aug. 25, 1942 (Aug. 14, 1940).—A process for producing a composite TiO_2-$BaSO_4$ pigment of improved tinting strength, color, and hiding power in which the TiO_2 content is in substantially the rutile crystalline state comprising dissolving, in relatively strong sulfuric acid, precipitated purified titanic acid obtained from the hydrolysis of a titanium sulfate solution, mixing the pure solution of titanium sulfate which results with a solution of a barium salt of a monobasic mineral acid, incorporating a relatively insoluble titanium-oxygen compound nucleating agent in the resulting mixture, hydrolyzing the barium sulfate-containing titanium solution which results, and then calcining the recovered composite precipitate to develop its pigment properties.

General

After victory—what? BENNETT CHAPPLE. *Bull. Amer. Ceram. Soc.*, **21** [8] 164–65 (1942).

Basic factors in vision. W. B. RAYTON. *Bausch & Lomb Mag.*, **28** [2] 6–9 (1942).—The relation between object distance and the ability to see detail is familiar to everyone. Visibility depends upon the angular size rather than the actual size of the object, i.e., upon the ratio of actual size to viewing distance. All objects at the limit of visibility appear about equal in size. Two dots or two lines whose center distance subtends about one minute are distinguishable. Color response and recognition are seriously modified by the level of illumination. Visual acuity depends upon the physiological state of the individual. R.H.B.

Ceramic schools in 1942 and their graduates. ANON. *Ceram. Age*, **39** [6] 179–202 (1942).—The curricula, faculty personnel, and graduating students of the following ceramic schools are given: (1) University of Alabama, (2) Georgia School of Technology, (3) University of Illinois, (4) Iowa State College, (5) Massachusetts Institute of Technology, (6) Missouri School of Mines and Metallurgy, (7) New York State College of Ceramics at Alfred University, (8) University of North Carolina, State College Unit, (9) Ohio State University, (10) Pennsylvania State College, (11) Rutgers University, (12) University of Texas, (13) Virginia Polytechnic Institute, (14) University of Washington, and (15) West Virginia University. Similar data on the following ceramic art schools are also presented: (1) Carnegie Institute of Technology, (2) University of Cincinnati, (3) Newcomb School of Art, Tulane University, and (4) Ohio State University. Illustrated. F.G.H.

Ceramics invasion. ANON. *Architectural Forum*, **77** [1] 37 (1942).—The problems of the ceramic industry in meeting the shortage of critical materials are discussed. The main problem is to capitalize the potentialities of new machinery that has revolutionized the industry in the past few years. The minor problem is a buying public that still insists on trellised rose patterns for tableware. Ceramic products of the future include glazed ceramic buttons on military uniforms, low pressure clay pipe for cross-country transport of fuel oil, and glass hospital equipment to replace steel. M.E.P.

Combating heat sickness. ANON. *Ind. Heating*, **9** [7] 882–86 (1942).—Disability and sickness of employees engaged in hot, heavy work can usually be traced to loss of salt from the body. According to medical research, employees engaged in light to medium work should take 4 to 6 10-grain salt tablets daily, workers in medium to heavy work should take 8 to 10 tablets daily, and those doing extra-heavy hot work for an 8-hr. day should have 12 to 15 tablets daily. Salt tablets can also be obtained with 70% salt and 30% dextrose for extra energy. M.Ha.

Costing as an aid to works management. D. MORRIS. *Claycraft*, **15** [10] 265–77 (1942).—M. discusses cost accounting under the following subjects: (1) rising costs, (2) what comprises cost, (3) purposes of costing, (4) analysis, (5) various sections of industry, (6) mine costs, (7) works costs, (8) various shapes and sizes, (9) wastage, (10) grog, and (11) raw materials, wages, and fuel, the three most important items. G.A.K.

Have you heterophoria? ANON. *Eyesight* (Bausch & Lomb Optical Co.), **4** [1] 9–11 (1942).—The eye malady heterophoria is the improper binocular response at the brain of a subject. The images are not formed on corresponding areas of the two retinas to give proper fusion, causing the perception of depth, contrast, and definition to be impaired. Ophthalmic correction is prescribed, and muscular exercises are advocated for the revitalization of the eyes. The Bausch & Lomb Optical Co. Ortho-Fusor set of carefully graded vectographs and Polaroid glasses provide stimulation for the eyes in convergence, accommodation, and stereopsis; in this manner, heterophoria is corrected. R.H.B.

Potential demand for metals, plastics, and ceramics. GEORGE C. BETZ. *Ceram. Age*, **39** [2] 42–43 (1942).—The inherent properties and the competitive positions of metals, plastics, and ceramics are outlined. B. suggests that the ceramic industry take the following steps to assure itself a fair share of future markets: (1) continue to improve its present products, (2) continue to develop entirely new products, (3) reduce manufacturing costs, (4) modernize its designs, (5) add glamour to its advertising, and (6) make available an authoritative and comprehensive ceramic products reference book. F.G.H.

Prevention of silicosis in plate glass sandblasting plants. R. PLUHAR. *Diamant*, **63** [8–9] 59–64 (1941).—Safety arrangements and apparatus are described, especially those for use in small plants and shops, where the number of silicosis cases has increased considerably in Germany. P. emphasizes correct operation and maintenance, particularly of masks. M.HA.

Ten thousand laboratory experts and scientists to handle war metallurgical research. ANON. *Bull. Amer. Ceram. Soc.*, **21** [8] 159–60 (1942).

Treasury of Science—complete scientific library. ANON. *Bull. Amer. Ceram. Soc.*, **21** [8] 172 (1942).

Useful I-beam chart. W. F. SCHAPHORST. *Chem. Industries*, **51** [1] 82 (1942).—A nomogram for quickly estimating the size of a steel I beam for supporting a load concentrated at the middle of the beam, a very extreme condition, is presented. The relation between the length of the span, the weight of the I beam, safe load, and the depth of the I beam is given. E.D.M.

Using foremen conferences to build morale. DALE PURVES. *Factory Management & Maintenance*, **100** [7] 99 (1942).—A unique plan for improving management-labor relations and increasing production with benefits to all concerned is discussed. The plan involves periodic conferences of foremen, management, and junior executives. N.R.S.

Working of patents. A. LUZZATTO. *Ceram. Age*, **39** [2] 47, 58, 60 (1942).—Proposed changes in the patent laws are briefly discussed. F.G.H.

BOOKS

Handbook of Scientific and Technical Societies and Institutions of the United States and Canada. Compiled by CALLIE HULL AND MILDRED PADDOCK (U. S. Section), S. J. COOK AND P. A. HOWARD (Canadian Section). *Bull. Nat. Research Council*, No. 106, 389 pp. (Jan., 1942). 4th ed. Price $4.00. Reviewed in *Chem. & Eng. News*, **20** [14] 926 (1942). F.G.H.

MacRae's Blue Book, 1941–1942. MacRae's Blue Book Co., Chicago and New York, 1941. 49th ed. 3728 pp. Price $15.00. Reviewed in *Mech. Eng.*, **64** [4] 318 (1942).—The new edition of this well-known and useful directory includes an alphabetical list of manufacturers, producers, and wholesalers with the addresses of branch offices; a minutely classified list of products with an extensive index; a list of towns of one thousand or more population with their trade facilities and railroad connections; and a list of trade names. F.G.H.

Patent Fundamentals. LEON H. AMDUR. Chemical Publishing Co., Inc., New York, 1941. 305 pp. Price $4.00. Reviewed in *Ceram. Age*, **38** [6] 174 (1941). F.G.H.

Thomas' Register of American Manufacturers. Thomas Publishing Co., New York, 1941. 32d ed. 5200 pp. Price, initial subscription, $15.00; renewal, $10.00. Reviewed in *Mech. Eng.*, **64** [8] 626 (1942).—This huge annual compilation of American manufacturers has its customary main sections: (1) the classified directory of products (with index) in which the firms are listed, with a capital rating, geographically under each product; (2) the alphabetical list of manufacturers, with addresses, subsidiaries, branches, etc.; and (3) the trade-name index. The newer arbitrary numbering of advertisers, with a separate key index which lists these numbers with their corresponding companies, is continued, chiefly for the use of purchasing agents. F.G.H.

PATENT

Coloring granules. M. H. VEAZEY (Patent and Licensing Corp.). U. S. 2,294,523, Sept. 1, 1942 (Nov. 29, 1938).

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MEMBERSHIP ROSTER OF THE AMERICAN CERAMIC SOCIETY

The Roster of paid members is being published for the use of the members of The Society. The list is alphabetical; Corporation Members are in black-face type, the name of the voting representative following in parentheses; Fellows are preceded by *; Institute of Ceramic Engineers are preceded by †; Charter Life, Life, Honorary, and Student Members are indicated after their respective names.

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Vanderbilt, R. T., Co. (Ira E. Sproat), 230 Park Ave., New York, N. Y.
Vanderpool, James W., 21 Spruce St., Dedham, Mass.
Van Etten, Charles L., 105 East 9th Ave., Homestead, Pa.
Van Houten, Robert M., 3411 Schubert Ave., Chicago, Ill.
Vanick, James S., International Nickel Co., Inc., 67 Wall St., New York, N. Y.

Van Orden, F. W., Union Electrical Porcelain Works, Inc., Box 762, Trenton, N. J.
*Van Schoick, Emily C., 60 E. Norwich Ave., Columbus, Ohio
*Van Schoick, E. H., Chicago Retort & Fire Brick Co., Ottawa, Ill.
Van Vlack, L. H. (Student), 405 Ash Ave., Ames, Iowa
Vaughan, T. Carter, Glass Tech. Lab., Hartford-Empire Co., Hartford, Conn.
*†Vaughan, W. Harry, Commerce Dept., T.V.A., Arnstein Bldg., Knoxville, Tenn.
Veale, Jack H., General Refractories Co., Baltimore, Md.
Veazie, Munro F., Owens-Corning Fiberglas Corp., Newark, Ohio
Veitch, Lloyd, 3799 Harrison St., Oakland, Calif.
Vereeniging Brick & Tile Co., Ltd. (L. Wishart), Box 49, Vereeniging, Transvaal, South Africa
Vesuvius Crucible Co. (Francis L. Arensberg), Box 29, Swissvale, Pa.
Vickers, Arthur E. J., Hazeldene, Junction Rd., Norton-on-Tees, Durham, England
Victor Insulators, Inc. (P. W. Price), Victor, N. Y.
Vielhaber, Louis, Lippestrasse 11, Duisburg, Germany
†Vincent, George L., 134 W. Wright St., Milwaukee, Wis.
Vitrefrax Corp. (R. W. Ellison), 5050 Pacific Blvd., Los Angeles, Calif.
Vitreous Steel Products Co. (Edgar H. Weil), Sta. D, Cleveland, Ohio
Vitro Mfg. Co. (E. M. Fleck), Corliss Sta., Pittsburgh, Pa.
Vodicka, Albert L., Aetna Porcelain Enameling Co., 4701 Augusta St., Chicago, Ill.
Vollmer, August, Jr., St. Louis Pottery Co., 5240–46 Northrup Ave., St. Louis, Mo.
Vollrath, A. J., 2123 North 6th St., Sheboygan, Wis.
Voss, Walter C., Rm. 5–229, Massachusetts Inst. of Tech., Cambridge, Mass.

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Wainer, Eugene, 2654 Whirlpool St., Niagara Falls, N. Y.
Waite, Virgil H., 433 Beech St., Berea, Ohio
Walden, Albert S., National Carbon Co., Cleveland, Ohio
†Waldschmidt, Milton H., 873 Ebner St., Columbus, Ohio
Walker, A. M., Australian Tesselated Tile Co., Mitcham, Victoria, Australia
*Walker, Francis W., Jr., 105 W. Second St., Frederick, Md.
Walker, Herbert M., Bailey-Walker China Co., Bedford, Ohio
Walker, Leander H., Chili-Gates Townline Rd., R.D. 5, Rochester, N. Y.
Walker, Prescott H., Carborundum Co., Niagara Falls, N. Y.
Wallace China Co., Ltd. (Wallace B. Wood), Box 47, Huntington Park, Calif.
Wallace, William W., 1209 N. Mercer St., New Castle, Pa.
Walsh, Donald E., Consolidated Feldspar Corp., East Liverpool, Ohio
Walsh, N. S. C., 4070 N. Main St., St. Louis, Mo.
*†Walton, S. F., Exolon Co., Blasdell, N. Y.
Walworth, Chester A., Libbey-Owens-Ford Glass Co., Charleston, W. Va.
Wampler, Roy N., Libbey-Owens-Ford Glass Co., Oakdale & E. Broadway, Toledo, Ohio
Ward, Charles J., 161 Rumsey Rd., Leaside, Ontario, Canada
Ward, Gilbert O., Cleveland Public Lib., 325 Superior Ave., N. E., Cleveland, Ohio
Ward, K. E., United Clay Mines Corp., Oakland & Prospect Sts., Trenton, N. J.
Warde, John M., Vereeniging Brick & Tile Co., Vereeniging, Transvaal, South Africa
Wardley, Thomas, Westpoint Rockware Ave., Greenford, Middlesex, England
Warren, Bertram E., Massachusetts Inst. of Tech., Cambridge, Mass.
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Washington Porcelain Co. (C. H. Ackerson), Willow St., Washington, N. J.
Wassman, L. G., Standard Sanitary Mfg. Co., Pacific Enamel Works, Box 9, Richmond, Calif.
Watkins, Joel H., 312 Raleigh Bldg., Raleigh, N. C.
Watkins, Ray T., U. S. Tariff Commission, Ceramic Div., Washington, D. C.
Watkins, W. J., Kentucky Clay Mining Co., Mayfield, Ky.
Watson, William, Box 49, Vereeniging, South Africa
Watson, William (Student), 305 Broad St., Wilson, N. C.
Watters, Clarence S., 218 Medical Arts Bldg., Hamilton, Ontario, Canada
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Wayne Labs. (John J. Shank), 17 E. Main St., Waynesboro, Pa.
Weathers, W. M., International Smelting & Refining Co., 577 Malvern Rd., Akron, Ohio
Weaver, Mrs. Arthur F., 11307 Hessler Rd., Cleveland, Ohio
Weaver, H. F., Peerless Pottery, Inc., 917 N. St. Joseph Ave., Evansville, Ind.
*Weaver, R. A., Ferro Enamel Corp., 4150 East 56th St., Cleveland, Ohio
Webber, John J., 0-394713, 84th Engr. Bn., Fort Clayton, Canal Zone
Webber, Mrs. Richard H., 437 Lake Shore Rd., Grosse Pointe, Mich.
Weber, August, Jr., Weber Electric Co., Schenectady, N. Y.
Webster, Charles E., 311 E. Beaver St., Zelienople, Pa.
Webster, Hugh B., Hulmeville, Pa.
Webster, Paul A., Moravia Rd., Avon, Conn.
Wedemeyer, N. G., Röhm & Haas Co., 222 W. Washington Sq., Philadelphia, Pa.
Wehtje, Ernst, Postbox 129, Malmö, Sweden
Wehtje, Karl Fredrik, A/B Rörstrands Porslinsfabriker, Lidköpings Porslinsfabrik, Lidköping, Sweden
Weidman, V. Wesley, 5815 Buffalo Ave., Niagara Falls, N. Y.
Weigel, William M., Missouri Pacific Bldg., St. Louis, Mo.
Weil, Edgar H., Vitreous Steel Products Co., Sta. D, Cleveland, Ohio
Weinfurtner, E. M., North American Refractories Co., National City Bank Bldg., Cleveland, Ohio
Weinstein, Alex, Ednal Co., 95 Madison Ave., New York, N. Y.
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Weller, Harvey C., Surface Combustion Corp., 2375 Dorr St., Toledo, Ohio
Welliver, William E., Georgia Kaolin Co., 1185 Mary St., Elizabeth, N. J.
*Wells, A. A., Homer Laughlin China Co., Newell, W. Va.
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Wells, Lloyd L., Jr., 7808 South Shore Dr., Chicago, Ill.
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West, Frank, Haslemere Greenlane, Buxton, Derbyshire, England
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Western Electric Co. (L. I. Shaw), Hawthorne Sta., Chicago, Ill.
Westinghouse Electric & Mfg. Co. (William F. Bailey), Derry, Pa.
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Williams, John A., Box 250, Trenton, N. J.
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Willis, James B., Engineers' School, Fort Belvoir, Va.
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Willson, Thomas A., Willson Products, Inc., Box 622 Reading, Pa.
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Wisconsin Porcelain Co. (L. A. Stohl), Sun Prairie, Wis.
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Wishoski, I. Stanley, *Industrial Heating*, Union Trust Bldg., Pittsburgh, Pa.
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Witschey, R. A., A. P. Green Fire Brick Co., 122 S. Michigan Ave., Chicago, Ill.
Witzemann, A. William, 564 Willis Ave., Youngstown, Ohio
*†Wolfram, H. G., Porcelain Enamel & Mfg. Co., Baltimore, Md.
Womeldorph, Raymond C. (Student) Company C, 31st Engr., Ft. Belvoir, Va .
Wood, Wallace B., Wallace China Co., Ltd., Box 47, Huntington Park, Calif.
Woodall, Edward L., Jr. (Student), 408 S. Fourth St., Smithfield, N. C.
Woodruff, Ernest W., 219 E. North Water St., Chicago, Ill.
Woods, William J., Pennsylvania Pulverizing Co., Box 587, Lewistown, Pa.
Woody, Fred C., 13810 Cranwood Park Blvd., Garfield Heights, Ohio
Wooley, Seward E., 43 E. Wright St., Waterloo, N. Y.
*†Worcester, W. G., Dept. of Ceramics, Univ. of Saskatchewan, Saskatoon, Saskatchewan, Canada
Work, Harold K., Jones & Laughlin Research Lab., 40 Longworth St., Pittsburgh, Pa.
Work, Lincoln T., Metal & Thermit Corp., Box 255, Rahway, N. J.
Wortley, G. W., R. & A. Main, Ltd., Gothic Works, Falkirk, Scotland
Wright, Ann T., College Club, 40 Commonwealth Ave., Boston, Mass.
Wright, Daniel K., Incandescent Lamp Dept. of General Electric Co., Nela Park, Cleveland, Ohio
†Wright, Edward P., Box 387, East Liverpool, Ohio
Wright, George C., 49 E. Prospect Ave., Pittsburgh 5, Pa.
Wright, J. W., 1129 Warren St., Alton, Ill.
Wygant, James F., 5020 Geraldine Ave., St. Louis, Mo.
Wysong, Charles F., Georgia School of Tech., Ceramic Engr. Dept., Atlanta, Ga.
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Yanovsky, Alexander, 13 Izola Ave., Fords, N. J.
Yarte, Andrew A., Apartado 497, Monterrey, N. L., Mexico
Young, Stanley H., Republic Steel Corp., Canton, Ohio
†Young, Willard G., 304 E. Walnut St., Robinson, Ill.
Yount, Richard V., Technological Inst., Northwestern Univ., Evanston, Ill.

Zabawsky, Zeno, Box 222, Victor, N. Y.
Zapfe, Richard C., 162 Penfield St., Pomona, Calif.
Zapffe, Carl A., Battelle Memorial Inst., 505 King Ave., Columbus, Ohio
Zarbo, George, Fenimore St., near Second, Vineland, N. J.
Zehm, Robert C., Joseph Dixon Crucible Co., Jersey City, N. J.
Zeiller, Irwin F., B. F. Drakenfeld & Co., Inc., 45–47 Park Place, New York, N. Y.
Zeiller, Oscar F., 42–38 204th St., Bayside, L. I., N. Y.

Zerfoss, Samuel, 215 Mineral Industries Bldg., State College, Pa.
Zimmer, Daniel B., 1381 Sedgwick Ave., New York, N. Y.
†Zimmer, David C., Patterson Refractories Co., East Liverpool, Ohio
Zink, George H. (Student), 204 Ceramics Bldg., Univ. of Illinois, Urbana, Ill.
†Zvanut, Frank J., Ferro Enamel Corp., 4150 East 56th St., Cleveland, Ohio
†Zwermann, Carl H., 806 W. Main St., Robinson, Ill.

MEMBERS IN SERVICE*

The following members of this Society are in fighting units of war service. There are several in service in Washington not included in this Service Roster. This list is probably not complete, and we would appreciate information on other members.

WILLIAM D. ANDERSON, Virginia Polytechnic Institute, Blacksburg, Va.
DENNIS R. BEASLEY, Akro Agate Co., Clarksburg, W. Va.
JOHN W. BELL, National Bureau of Standards, Washington, D. C.
D. N. BROWN, Georgia School of Technology, Atlanta, Ga.
GEORGE E. BROWNEWELL, Ohio State University, Columbus, Ohio.
C. W. BRYANT, JR., Georgia School of Technology, Atlanta, Ga.
C. E. BUTLER, JR., Virginia Polytechnic Institute, Blacksburg, Va.
ROBERT L. COLEMAN, Illinois Brick Co., Chicago, Ill.
ALBERT C. EDGAR, Edgar Plastic Kaolin Co., Metuchen, N. J.
CLYDE B. ELLER, JR., Iowa State College, Ames, Iowa.
ELMO A. FORDHAM, New York State College of Ceramics, Alfred, N. Y.
CARLTON E. GOUDGE, University of Washington, Spokane, Wash.
DWIGHT F. GUSTAFSON, 1st Medical Lab., A.P.O. 308, Leesville, La.
ANDREW M. HARVEY, JR., Roanoke-Webster Brick Co., Roanoke, Va.
THOMAS L. HURST, Mellon Institute, Pittsburgh, Pa.
GLENN A. HUTT, Ferro Enamel Corp., Cleveland, Ohio.
CHARLES J. KOENIG, Engineering Experiment Station, Ohio State University, Columbus, Ohio.
CLAUDE A. LINDQUIST, JR., New York State College of Ceramics, Alfred, N. Y.
JACK E. MORGAN, Pennsylvania State College, State College, Pa.
ROBERT W. SCAMMELL, Rutgers University, New Brunswick, N. J.
WILLIAM E. SCHLAKE, University of Illinois, Urbana, Ill.
THOMAS S. SHEVLIN, Ohio State University, Columbus, Ohio.
HOWARD O. SNODGRASS, General Electric Co., Cleveland, Ohio.
GLENN C. TRUESDELL, U. S. Bureau of Mines, University, Ala.
H. L. WATTS, Dept. of Mines, Industrial Minerals Div., Ottawa, Ontario, Canada.
L. DON WHEATON, Bausch & Lomb Optical Co., Rochester, N. Y.
GEORGE H. ZINK, University of Illinois, Urbana, Ill.

* See also Service Roster published in September, 1942, *Bulletin*, opposite p. 179.

Fine Translucent China Made in America More Than a Century Ago

1769, Gousse Bonnin and George A. Morris, Philadelphia, Pa.
1816, Dr. Mead, New York, N. Y.
1825, William Ellis Tucker, Philadelphia, Pa.
1829, D. and J. Henderson, Jersey City, N. J.
1832, Joseph Hemphill, Philadelphia, Pa.
1833, American Pottery Mfg. Co., Jersey City, N. J.
1840, Charles J. Boulter, Philadelphia, Pa.

HERE IS A BOOSTER OFFER

New Personal Members enrolled after October 15 may elect to

(1) pay one-fourth of the annual fee or $3.13 and receive only the October, November, and December publications or

(2) pay the full $12.50 for 1942 membership and receive all of the 1942 publications or

(3) pay $12.50 and join as of 1943 and receive the December, 1942, issues (which include the indexes) as a bonus.

PAID MEMBERSHIP AND SUBSCRIPTION RECORD

Date of Record	Members Paid		Deferred	Subscriptions	Monthly Sales	Total Circulation
	Personal	Corporation				
December 21, 1941	2029	257	37	609	220	3152
January 21, 1942	2043	254	38	600	220	3155
February 21, 1942	2083	255	34	605	220	3197
August 21, 1942	1979	258	24	401	220	2882
September 21, 1942	2002	261	20	449	220	2952
Last year this time	1963	254	43	592	220	3072

IN SPITE OF THE LARGE LOSS OF FOREIGN MEMBERS AND SUBSCRIBERS, THERE IS AN INCREASE IN NUMBER OF MEMBERSHIP SUPPORTERS OF THE SOCIETY.

All dues are deductible under the provisions of the Federal Income Tax Law.

NEW MEMBERS FOR SEPTEMBER

Corporation

BRITISH SCIENTIFIC INSTRUMENT RESEARCH ASSOCIATION, A. J. Philpot (voter), 26 Russell Square, London, W. C. 1, England.

FERRO ENGINEERING CO., Walter M. Charman (voter), 1208 Hanna Bldg., Cleveland, Ohio.

OWENS-ILLINOIS GLASS CO., E. W. Summers (voter), Alton, Ill.

WILLSON PRODUCTS, INC., Thomas A. Willson (voter), Box 622, Reading, Pa.

Personal

ABBEY, R. G., 1600 Real Estate Trust Bldg., Philadelphia, Pa.; chemical engineer, General Refractories Co. (formerly in name of Chester E. Grigsby).

ANDERSON, LT. WILLIAM D., Btry. F, 10th CA, Fort Church, R. I.; U. S. Army officer.

BISHOP, EDWARD, 47 Bedford Crescent, Freezywater, Enfield, Middlesex, England; research technologist, Messrs. Muren Welding Processes, Ltd.

DERGE, GERHARD, Carnegie Institute of Technology, Pittsburgh, Pa.; assistant professor of metallurgy, Metals Research Lab.

FISHER, HENRY C., 1 New Bond St., Worcester, Mass.; refractories sales engineer, Norton Co.

FITCH, WILLIAM H., Plainfield National Bank Bldg., Plainfield, N. J.; president, Fitch Recuperator Co.

FLORENCE, LT. J. M., 4556 Aldine St., Philadelphia, Pa.; 2nd Lt., Ordnance Dept., Frankford Arsenal.

GRIGG, PAUL E., Miller Drive, North Muskegon, Mich.; superintendent, American Porcelain Enamel Co.

GUSTAFSON, CPL. DWIGHT F., 1st Med. Lab., A.P.O. 308, Leesville, La.

MILLMAN, NATHAN, Huber, Ga.; chief chemist, Huber Co., Inc.

NEWBRANDER, STANLEY M., Weirton Steel Co., Weirton, W. Va.; assistant chief metallurgist.

SALGO, ELMER T., 228 W. Houston St., New York, N. Y.; general manager, Diana Ceramic Products.

SCHELL, RALPH L., Edgewater Steel Co., Allegheny Co., Oakmont, Pa.; superintendent of open hearth.

SEARSON, LESLIE, James Oakes & Co. (Riddings Collieries), Ltd., Jacksdale, Nottinghamshire, England; general manager.

SMITH, RUSSELL C., 713 North 37th St., East St. Louis, Ill.; mason foreman, American Steel Foundries.

STOTT, JOSEPH A., 506 Otis Bldg., Philadelphia, Pa.; sales representative, North American Refractories Co.

WALKER, KEITH F., 711 E. Tyler St., Athens, Texas; prospecting geologist, Harbison-Walker Refractories Co.

WEISS, W. RUSSELL, Wellsville, Mo.; plant engineer, Wellsville Firebrick Co.

WHITESELL, LYSLE E., Wellsville, Mo.; general manager, Wellsville Firebrick Co.

Student

Massachusetts Institute of Technology: SHAHAP S. KOCATOPCU.

MEMBERSHIP WORKERS' RECORD

Corporation

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J. W. Wright	1	Office	1

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P. S. Dear	1	Alexander Pupulidy	1
T. A. Klinefelter	1	D. E. Sharp	1
L. H. Milligan	1	L. J. Trostel	1
Office	7		

Student

F. H. Norton 1

Grand Total **24**

EDITORIAL

OUR MOST IMPORTANT MATERIAL RESOURCE*

BY A. I. ANDREWS

We all agree that to win the war America must learn to use its resources to best advantage. Man power is one of the most important resources we have and is one which has not yet been allocated to obtain the maximum efficiency. At the beginning of the first World War at Gallipoli in 1915, the British had this brought home to them in the death of Henry Moseley, the most promising physicist in the twentieth century, whose technical genius could have been used much more effectively than by facing a gun.

Today, American technical men are being inducted into the army and are being allowed to enlist in all of the branches of the service. Why is this permitted when we all look forward to a long hard war where technical men must be depended upon not only to supply present tools of war but also tools that are not yet invented? In a mechanized war, new developments have been shown to give great advantages to the men who are on the firing lines.

For every seasoned engineer, ceramist, physicist, and chemist, there must be a group of younger technical men to carry out the details of a project. Among these assistants is our only supply of future experts and leaders in engineering and the other technical fields. It is recognized that a certain proportion of these men are needed in the armed services as technical men, but too many are shouldering a gun.

The selective service system is designed to designate the allotment of man power where it will accomplish the most good toward winning the war. The system is functioning badly, however, and there is a crying need for an immediate change before irreparable damage is done to our man-power resources. The responsibility now rests with the draft boards, the employer, and the man himself.

The draft boards are under constant pressure and are ill-informed. They do not, as a group, realize the importance of and do not understand the situation. It is left for the employer and the man to convince their boards of the desirability for conserving the technical skill, education, and training of American man power. This presents a difficult problem for the employer, and the men themselves hesitate to avoid the service for fear that it will be taken as

* Received September 11, 1942.

an indication that they are not patriotic. This applies particularly to the younger men who are being constantly embarrassed by remarks from friends and others concerning their failure to enter the service.

Most everyone is acquainted with these conditions and knows of many cases where such men have joined the service and have not been placed where they can use their training. The necessary changes in the situation must be made not only in the general allocation of men but also in the war services where these men should be used advantageously.

DEPARTMENT OF CERAMIC ENGINEERING
UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS

SALUTE TO SOME OF OUR MEMBERS IN ESSENTIAL SERVICE

ALBERT RAY OLPIN

Albert Ray Olpin, director of the Ohio State University Research Foundation, Columbus, Ohio, has been appointed chairman of the Research Advisory Committee of the National Association of Manufacturers. He succeeds Karl T. Compton, president of the Massachusetts Institute of Technology, who has resigned because of the pressure of other war work in which he is engaged.

Albert Ray Olpin

Biography

Dr. Olpin was born in Pleasant Grove, Utah, June 1, 1898. He received his B.A. degree (major in physics) from Brigham Young University, Provo, Utah, in 1923, and his Ph.D. degree in physics from Columbia University, New York, N. Y., in 1930. During his college days, Dr. Olpin spent four years in Japan, where he obtained a thorough working knowledge of the Japanese language. From 1925 to 1933, he was a member of the technical staff of the Bell Telephone Laboratories, New York, N. Y., and from 1933 to 1939, he was director of research for the Kendall Mills, Charlotte, N. C. He has been director of the Ohio State University Research Foundation since 1939. In his capacity as director, Dr. Olpin is responsible for the administration of all University war research contracts. He has also been appointed a consultant to a division of the National Defense Research Committee and of the War Production Board.

(1942)

Membership in Technical Organizations

Dr. Olpin is a member of the American Physical Society, the American Association for the Advancement of Science, the American Chemical Society, the National Farm Chemurgic Council, the Ohio Academy of Science, Sigma Xi, and The American Ceramic Society.

Committee Membership and Editorial Work

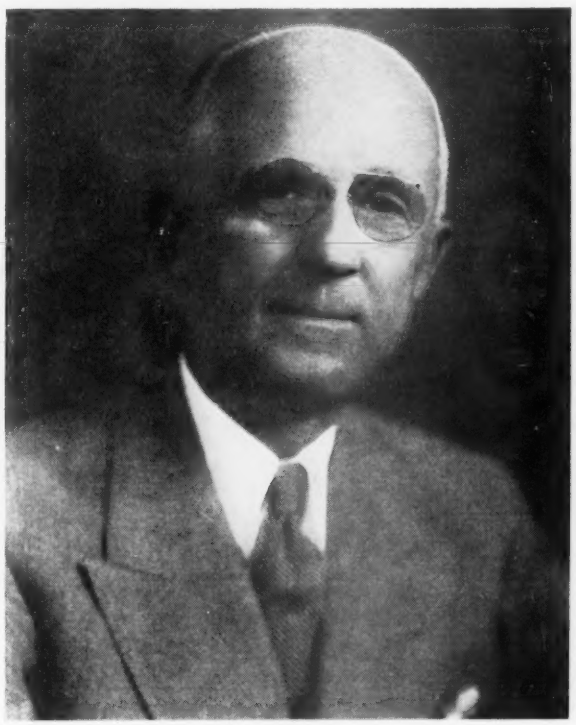
Dr. Olpin is chairman of the Science Advisory Committee of the National Association of Manufacturers and chairman of the Research Committee of the Ohio Chemurgic Commission. He is associate editor of the *Review of Scientific Instruments*, former associate editor of the *Journal of Applied Physics*, and author of numerous technical publications.

PHAON HILBORN BATES

Phaon Hilborn Bates, Chief of the Clay and Silicate Products Division, National Bureau of Standards, Washington, D. C., has been elected vice-president of the American Society for Testing Materials.

Biography

Mr. Bates was born in Sipesville, Pa., August 1, 1879. After attending grade school in Johnstown, Pa., and high school in Philadelphia, Pa., where he received his B.A. degree in 1898, he entered the University of Pennsylvania and received his B.S. degree in 1902.



Phaon Hilborn Bates

From 1902 to 1906, he was assistant chemist for the Pennsylvania Railroad; from 1906 to 1910, he was chemist for the Technologic Branch of the U. S. Geological Survey, St. Louis, Mo.; and from 1910 to 1919, he was in charge of the Pittsburgh Branch of the National Bureau of Standards. During the next two years, Mr. Bates was chief of the Structural Miscellaneous Materials Division at the National Bureau of Standards and was also acting chief of the Ceramic Division. He has been in his present position since 1921.

Activities in Technical Organizations

Mr. Bates has been chairman of A.S.T.M. Committee C–1 on Cement since 1926. In 1940, he was the A.S.T.M. Edgar Marburg Lecturer on the subject "Portland Cement —Theories (Proven and Otherwise) and Specifications."

He is past-president of the American Concrete Institute and was awarded the Turner Medal by the Institute in 1939 for his contributions to science, his direction of research, and his outstanding leadership in advancing the intelligent utilization of cement and concrete. Mr. Bates is the author of more than sixty publications dealing with research in hydraulic cement, concrete, etc.

Mr. Bates has been a member of The American Ceramic Society for almost twenty years. He became an associate member of The Society in 1913 and an active member in 1916. He is also a Charter Fellow of The Society.

Mr. Bates is also a Fellow of the American Association for the Advancement of Science and a member of the American Chemical Society.

OLIVER BOWLES

Oliver Bowles, geologist, mining engineer, and internationally known authority on nonmetallic minerals, has been named chief of the Nonmetal Economics Division of the U. S. Bureau of Mines, Washington, D. C.

Dr. Bowles, who formerly was assistant chief of the Nonmetal Economics Division, has been with the Bureau since 1914. He is the author of more than one hundred Bureau of Mines publications, including eight bulletins, and has contributed hundreds of articles to technical publications in the field of nonmetallics. For the past seven years, he has contributed a yearly résumé of the nonmetallic mineral industries of the United States for *Mining and Metallurgy*. His 500-page book, The Stone Industries, is one of the most comprehensive volumes written regarding quarrying in the United States and has been circulated widely.

As chief of the Nonmetal Economics Division of the Bureau, Dr. Bowles fills a vacancy created by the resignation of Paul M. Tyler, who left the Bureau to join the Board of Economic Warfare.

Biography

Dr. Bowles was born near Lindsay, Ontario, Canada, January 10, 1877. After receiving his preparatory education at the Lindsay Collegiate Institute, he attended the University of Toronto, where he received his B.A. degree in 1907 and his M.A. degree in 1908.

After coming to the United States in 1908 (he became a naturalized citizen in 1914), Dr. Bowles taught mineralogy and petrography at the University of Michigan and at the University of Minnesota for six years. He also took graduate work at both universities and later received his Ph.D. degree from George Washington University in 1922. During the summer months of this same period, Dr. Bowles gained extensive experience in the field of geology by carrying on geologic field work in the wilds of Northern Ontario (1908–1910) and by working for the State Geological Survey of Minnesota (1911–1913). During parts of 1912 and 1914, he was also temporary geologist with the U. S. Geological Survey.

Joining the Bureau of Mines in 1914, he was successively quarry technologist, 1914–1917; mineral technologist, 1917–1923; supervising engineer, Nonmetallic Minerals Experiment Station, New Brunswick, N. J., 1923–1928; supervising engineer, Building Materials Section, 1928–1937; and assistant chief, Nonmetal Economics Division, 1937 to the present time.

Oliver Bowles

Society Memberships

Dr. Bowles is a member of the American Institute of Mining and Metallurgical Engineers, the Mineralogical Society of America, the New York Academy of Sciences, and Sigma Xi and is an Honorary Member of the Institute of Quarrying of Great Britain.

GEORGE JOSHUA BAIR

George Joshua Bair, until recently associated with Mellon Institute, Pittsburgh, Pa., has joined the staff of the Corning Glass Works, Corning, N. Y., where he will be engaged in development work in connection with the war effort.

Biography

Dr. Bair was born at Emporium, Pa., August 26, 1905. After attending the Emporium grade and high schools, he entered the Pennsylvania State College, where he received his B.S. degree in ceramic engineering in 1927 and his M.S. degree in 1930. In 1936, he was granted the D.Sc. degree in ceramics from the Massachusetts Institute of Technology.

In 1927, Dr. Bair was appointed instructor of ceramic engineering at the Pennsylvania State College and was advanced to the rank of assistant professor in 1931. He remained on the staff until June, 1936, when he was appointed Senior Industrial Fellow at Mellon Institute to develop uses for the waste grinding sands of the plate-glass industry. During this time, he developed the processed silica product, Garspar, and designed, constructed, and operated the processing plant of Garco Products, Inc., at Ford City, Pa., for the production of this product.

Activities in The American Ceramic Society

Dr. Bair is a Fellow of The American Ceramic Society and has been a member since 1926. He has served as chair-

man of the Refractories Division Data Committee, 1933–1934 (also as a member of the Program Committee, 1937–1939), of the White Wares Division Membership Commitee, 1940–1941, and of the Materials and Equipment Division Standards Committee, 1941–1942. He was also secretary of the Pittsburgh Local Section in 1939–1940, vice-chairman in 1940–1941, and has been chairman since 1941.

Member of Other Societies

Dr. Bair is also a member of the American Chemical Society, Sigma Xi, Tau Beta Pi, and Sigma Gamma Epsilon.

George Joshua Bair

Publications

(1) (With J. B. Shaw) "New-Type High-Temperature Fusion Furnace," *Jour. Amer. Ceram. Soc.*, **12** [7] 447–50 (1929).

(2) (With J. B. Shaw and M. C. Shaw) "Progress Report on Development of Abrasion Test for Refractories at High Temperatures," *ibid.*, **13** [7] 427–36 (1930).

(3) "Constitution of Lead Oxide-Silica Glasses: I, Atomic Arrangement," *ibid.*, **19** [12] 339–47 (1936); "II, Correlation of Physical Properties with Atomic Arrangement," *ibid.*, pp. 347–58.

(4) "Garspar," *Ceram. Ind.*, **32** [2] 68 (1939).

(5) Engineering Opportunities. Appleton-Century Co., Inc., New York, 1939.

Patents

(1) "Utilizing Waste Sand Resulting after Glass Grinding," Ger. 687,157, Dec. 28, 1939.

(2) (With R. A. Miller) "Manufacture of Siliceous Bodies," U. S. 2,220,750, Nov. 5, 1940.

(3) "Manufacturing Glass," U. S. 2,230,343, Feb. 4, 1941.

(4) (With J. S. Cort, Jr.) "Removing Magnetic Impurities from Finely Divided Materials," U. S. 2,230,344, Feb. 4, 1941.

(5) "Manufacture of Ceramic Ware," U. S. 2,233,575, March 4, 1941.

(6) "Siliceous Body," U. S. 2,247,270, June 24, 1941.

(7) "Manufacture of Glazed Ceramic Bodies," U. S. 2,264,499, Dec. 2, 1941.

(1942)

UNIVERSITY OF ILLINOIS

Staff Changes

The Department of Ceramic Engineering at the University of Illinois started the fall session with several changes on the staff. A. I. Andrews assumed the duties as Head of the Department of Ceramic Engineering upon the retirement of C. W. Parmelee. A. E. Badger was promoted from research assistant professor of ceramic engineering to research associate professor of ceramic engineering, and C. G. Harman was promoted from instructor to assistant professor of ceramic engineering.

F. A. Petersen, B.S. University of Illinois '37 and M.S. Ohio State University '39, was appointed special research associate to continue the investigation under the Enamel Utensil Manufacturing Council Fellowship. He was associated formerly with the Florence Stove Co., Gardner, Mass. G. H. Zink, who formerly held this Fellowship, left the staff for a commission as Second Lieutenant in the Cavalry.

C. R. Filippi, B.S. '37 in Ceramic Engineering, was appointed an assistant in the Department of Ceramic Engineering. He was associated formerly with the Illinois Brick Co., Chicago, Ill., as development engineer.

A. C. Ottoson is leaving the University to take a position with the Imperial Glass Corp., Bellaire, Ohio.

WEST VIRGINIA UNIVERSITY TO DEDICATE NEW MINERAL INDUSTRIES BUILDING OCTOBER 16 AND 17

As a fitting tribute to the opening of the institution's seventy-sixth academic year, West Virginia University, Morgantown, W. Va., on October 16 and 17 will dedicate its new million-dollar Mineral Industries Building, one of the finest structures of its kind in the United States.

The building is an appropriate and essential addition to the University campus because of the magnitude of coal, oil and gas, chemical, metallurgical, and ceramic industries in West Virginia. The completion of the building is especially timely because of the vital role the State is playing in the war effort.

Begun in 1940 after years of careful planning, the build-

New Mineral Industries Building

ing embodies factors which make it the fulfillment of the dreams of the scientist, engineer, teacher, and student.

Friend E. Clark, Chairman of the Graduate Council

Now completed and fully equipped, it houses the School of Mines, the West Virginia Geological Survey, the Department of Geology, and the Department of Chemical, Metallurgical, and Ceramic Engineering.

Friend E. Clark, chairman of the University Graduate Council and head of the Department of Chemistry, in his capacity as chairman of the dedication committee, has announced a tentative two-day program which will include speakers of national and state-wide reputation, including Governor M. M. Neely and Charles E. Lawall, president of the University.

Following registration on the morning of October 16, the building will be inspected. The dedication ceremonies will be held at 2:00 P.M. on the same day. Various scientific and industrial groups have scheduled their annual meetings for the evening and for all of the next day.

An imposing six-story structure situated at the gateway to the campus, the building is not only a valuable addition to the research and instructional facilities of the University, but also contributes to the architectural beauty of the campus, which is fast growing into one of the most attractive campuses in the country. The Mineral Industries Building is situated on property which for years was the residence of the late I. C. White, an early graduate of the University and one of the foremost geologists of the world and long-time state geologist of West Virginia.

The building is so large and so thoroughly equipped (including minute details) that it cannot be described fully. Perhaps the story is most speedily told in the message of a large interpretive mural in the auditorium on the ground floor. Here Artist Robert L. Lepper of Pittsburgh has portrayed the industries of West Virginia, a state of great natural resources, whose industries are molded accordingly. The canvas is crowded with a panorama of processes, natural resources, finished products, and the equipment and workers as each contributes his share to the transformation process.

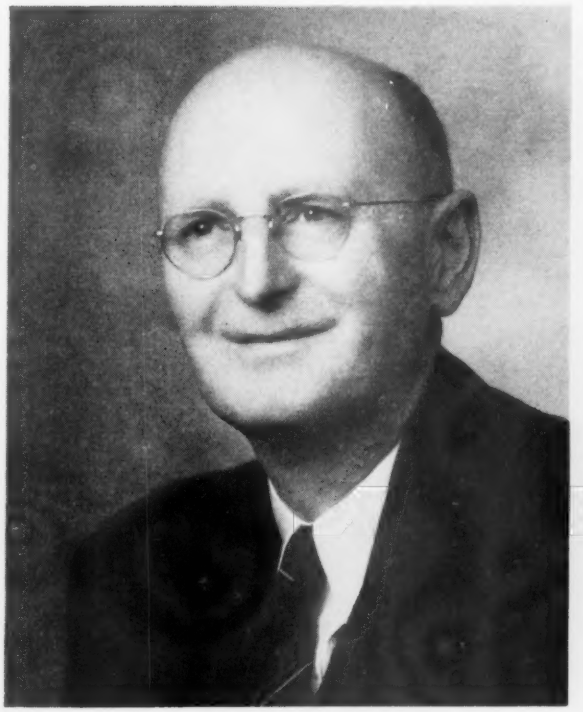
The Department of Chemical, Metallurgical, and Ceramic Engineering occupies, in the main, the basement, ground, and the second floors of the western half of the building, two large rooms on the first floor, and in addition a large unit operations laboratory 40 by 90 feet and 25 feet high.

The Department offers not only the regular four-year course in chemical engineering but also options in metallurgy and ceramics. It has been provided with exceptionally good laboratories for the study of all three branches and also with three special research laboratories.

The ground floor contains two ceramic laboratories. A large room, 25 by 43 feet, will be used for general laboratory instruction as well as for special investigations and in summer will be used for the course in practical pottery that has become increasingly popular. The laboratory contains a blunger, agitator, lawn, slip pump, filter press, a combined pug mill and brick machine, a dry-press tile machine, several electric furnaces, four potters' wheels (with five more being constructed), a jigger, a tensile testing machine, volumeters, and a spray booth. A 3-h.p. abrasive cut-off machine is installed in the laboratory for cutting ceramic ware. The laboratory contains five display cases.

Willard W. Hodge, Head of the Department of Chemical Engineering

Directly across from the ceramic laboratory is the furnace and grinding room. This room contains a clay-testing kiln, a pottery kiln, a frit furnace, a general heating furnace, a fusion-point furnace, and an electric-arc furnace. Along one wall are placed a jaw crusher, roll crusher, disk grinder, wet pan, a 30-in. ball mill, a bank of pebble mills, a small portable pebble mill, and a Ro-Tap screening machine. This room also contains a set of bins for storing raw materials. All machines in both rooms are individually motor-driven.



W. A. Koehler, Professor of Chemical and Ceramic Engineering

Paul H. Price, Head of Department of Geology and Director of West Virginia Geological Survey

In addition to these rooms and equipment, all of the facilities of the Department of Chemical Engineering are available to ceramic students and research workers. This includes the large unit operations laboratory with special humidity-controlled driers, a variety of filtration units, mixers, and other equipment, the engineering chemistry laboratory, the metallurgical laboratory, the electrochemical laboratory, the fuels laboratory, a drafting room, and an exceptional completely equipped shop for the repair and construction of new equipment. The Department has a large locker room with showers and an industrial washer. Elevator service connects all of the floors.

The School of Mines occupies, in the main, the east half of the building except for the two upper floors. The large coal laboratory, similar to the chemical engineering unit operations laboratory, contains modern coal processing and handling machinery. A number of laboratories are modernly equipped for classroom and research instruction for the various divisions of the mining, oil, and gas industries.

The third and fourth floors of the building are occupied by the Department of Geology and the West Virginia Geological Survey. Both of these departments are modernly equipped with all the laboratories for instruction and research. The Survey, now one of the foremost in the country, has also an up-to-date museum and a large library.

The spectrograph laboratory, equipped with a large modern spectrograph and complete auxiliaries, is one of the outstanding additions provided by the building. Through spectrography, it is possible to determine more accurately the extent to which such materials as coal, ash, clay, glass, sand, and various rocks contain compounds and elements in small quantities.

In addition to the various specialized laboratories, there is a general analytical laboratory where routine analyses on a wide variety of materials, including clay, limestone, sandstone, soil water, brine, and ores, are made.

All of the departments in the new building are geared to work in close cooperation, both in regard to equipment and personnel; the whole unit is outstanding in regard to facilities and cooperative endeavor.

NECROLOGY

HARRY V. WALLACE

Harry V. Wallace, vice-president and director of sales of the Kimble Glass Company, died suddenly at his home in Vineland, N. J., September 15, 1942.

Mr. Wallace was born June 28, 1894, in Sulphur Well, Ky., but spent his boyhood in Wenatchee, Wash. He had been working in power plants in that region and studying when he could find opportunity at the University of Oregon when he enlisted in the U. S. Marines in June of 1917 to serve throughout the war.

After experience in the sales field with the Socony-Vacuum Company and the Owens-Illinois Glass Company, Mr. Wallace joined the Kimble Glass Company on October 1, 1931, as Chicago branch manager. In January, 1939, he was transferred to the main office of the Company in Vineland, N. J., and on June 7, 1939, he became vice-president and director of sales.

Late in January, 1941, Mr. Wallace was stricken with coronary thrombosis. Though severely ill for more than a year, he was apparently rallying remarkably and had been spending some time at his desk in anticipation of resuming his duties, when death intervened.

NORMAN G. SMITH

Norman G. Smith, vice-president and director of the Consolidated Feldspar Corp., Trenton, N. J., died at his home in Trenton on August 7, 1942. He was sixty-nine years old. At the time of his death, Mr. Smith was in

charge of the Consolidated Feldspar mines and mills in the Maine area.

He became associated with the Consolidated Feldspar Corporation in 1929 when his company, the Maine Feldspar Co., with mills at Auburn and Topsham, Maine, was included in a merger of the Consolidated Feldspar organization.

ALFRED NELSON FINN

Word has just been received of the death of Alfred Nelson Finn, chief of the Glass Section of the National Bureau of Standards, Washington, D. C., and a Fellow of The American Ceramic Society. Mr. Finn, who had celebrated his sixtieth birthday on August 10, died on September 21 in Lincoln, Nebraska, where he had been residing in an attempt to regain his failing health.

Alfred Nelson Finn

Mr. Finn had been a member of The Society for twenty years, becoming an associate member in 1922 and an active member in 1924. Identifying himself with the Glass Division, he had served on numerous committees and as secretary for four years.

ANDREW MALINOVSZKY

Andrew Malinovszky, a Charter Fellow of The American Ceramic Society, died recently at his home in South Gate, Calif. Associated with the ceramic industry for over forty years, Mr. Malinovszky at the time of his death had been engaged as consulting chemist in conducting special researches in connection with war work.

Biography

Andrew Malinovszky was born in Vienna, Austria, in 1875. Following his graduation as chemical engineer from the Staat Realschule in Vienna in 1895, he obtained employment in the porcelain factory owned by his father. He left the factory two years later to attend schools in Lauban and Bunzlau, Germany. From 1899 to 1902, he was associated with Dr. Grunwald as assistant ceramist, during which time he was engaged as an enamel consultant for various companies in England and France. From 1902 to 1904, he was associated successively with the Zsolnay Porcelain Manufacturing Company and the Herender Porcelain Manufacturing Company in Budapest, Hungary.

Andrew Malinovszky

Coming to the United States in 1904, Mr. Malinovszky entered the employ of the General Electric Co., Schenectady, N. Y., where he worked in the paint and cement and insulating varnish departments. He remained with this Company until 1909, when he left to take charge of the Industrial Research Laboratory of the H. H. Randolph Company in Chicago, Ill.

From 1919 to 1921, he worked as ceramic engineer with the Blackmer and Post Pipe Co., St. Louis, Mo., and from 1921 to 1931 as chemist and ceramic engineer at the Washington Iron Works, Los Angeles, Calif., where he was in charge of enameling research and of the plant foundry. Part of this time (from 1926 to 1931), he was also associated with the Milbrae porcelain sanitary-ware plant, a plant connected with the Washington Iron Works.

From 1931 to 1933, Mr. Malinovszky was associated with the Gladding, McBean & Company, Los Angeles, Calif., where he was engaged in ceramic research. During this time, he introduced his patent process for wall-tile and artware bodies and glazes (the artware was known as Malinite and Franciscan ware). From 1933 to 1936, he was engaged as consulting ceramic engineer to work out bodies and glazes and refractories respectively for Pacific Clay Products and the Emsco Refractories Company, both of Los Angeles, Calif.

In 1936, Mr. Malinovszky organized the Elescul Corporation to manufacture electrical porcelain insulators, vent pipes, and high-heat resistant insulator brick.

Society Memberships

Mr. Malinovszky became an associate member of The American Ceramic Society in 1915 and an active member in 1923. He served as chairman of the California Local Section in 1924–1925.

He was also a member of the American Institute of Chemical Engineers, the Illinois State Academy, and the British Ceramic Society.

Publications

(1) "Chemical Stoneware," *Trans. Amer. Inst. Chem. Eng.*, **11**, 103–18 (1918).
(2) "Malinite Process for Production of Sillimanite Refractories," *Jour. Amer. Ceram. Soc.*, **3** [1] 40–68 (1920).
(3) "Commercial Synthesis of Sillimanite," *Chem. & Met. Eng.*, **22**, 851 (1920).
(4) "Alkali Analysis to Avoid Platinum Crucible Stains Inside the Wall," *Chemist-Analyst*, **14** [36] (May, 1922).
(5) "Method of Cooling Enamel by Compressed Air," *Jour. Amer. Ceram. Soc.*, **6** [9] 972–73 (1923).
(6) "Tables for Calculating Melted Weight and Coefficient of Expansion of Enamels," *Ceramist*, **7** [1] 23–28 (1925).
(7) "Free Quartz in Feldspar," *ibid.*, [6] 512.
(8) "Sillimanite Refractories," *Bull. Amer. Ceram. Soc.*, **4** [12] 637–38 (1925).
(9) "Enameling Defects Due to Cast Iron," *Jour. Amer. Ceram. Soc.*, **8** [1] 72–78 (1925).
(10) "Refractory Value of Ground Coat and Enamel," *Ceramist*, **8**, 38 (1926).
(11) "Tables to Facilitate Ceramic Calculations," *ibid.*, [9] 570–80.
(12) "Defects in Enamel Due to Cast Iron," *Jour. Amer. Ceram. Soc.*, **9** [12] 805–13 (1926).
(13) "Microphotographic Study of Free Quartz in Feldspar," *ibid.*, **10** [1] 23–29 (1927).
(14) "Agreement of Ground Coat and Enamel," *ibid.*, [4] 275–77.
(15) "Acid-Resistant Enamels," *ibid.*, **11** [2] 110–13 (1928).
(16) "Vitreous Enamel and Its Defects," *ibid.*, **12** [3] 180–87 (1929).
(17) "Raw and White Ground Coat," *ibid.*, **13** [4] 277–84 (1930).

U. S. Patents

(1) "Ceramic Material," U. S. 1,016,345, Feb., 1912.
(2) "Ventilating Device for Mines and Plants," U. S. 1,047,960, Dec. 15, 1912.
(3) "Ceramic Material," U. S. 1,110,449, Sept. 15, 1914.
(4) "Molding Machine," U. S. 1,210,664, Jan. 2, 1917.
(5) "Brick Machine," U. S. 1,310,953, July 22, 1919.
(6) "Making Tile," U. S. 1,819,686, Aug. 18, 1931.
(7) "Method and Apparatus for Manufacturing Ceramic Bodies," U. S. 1,940,554, Dec. 19, 1933.
(8) (With A. L. Bennett) "Red Glaze," U. S. 2,020,559, Nov. 12, 1935.

(9) "Ceramic Products Composed Mainly of Silica, Magnesia, and Alkalis," U. S. 2,025,762, Dec. 31, 1935.
(10) "Ceramic Tile Composition," U. S. 2,072,460, March 2, 1937.
(11) (With A. L. Bennett) "Red and Yellow Glaze Compositions," U. S. 2,083,033, June 8, 1937.
(12) "Electrical Insulator," U. S. 2,092,982, Sept. 14, 1937.
(13) "Ceramic Composition," U. S. 2,106,410, Jan. 25, 1938.
(14) "Wall Structure," U. S. 2,118,936, May 31, 1938.

Foreign Patents

Mr. Malinovszky had been granted the following foreign patents: (1) Brit. 370,959, Oct. 15, 1929; (2) Ger. 595,643, Oct. 7, 1930; (3) Fr. 704,617, Oct. 9, 1930; (4) Ital. 296,995, Oct. 11, 1930; (5) Span. 120,148, Oct. 22, 1930; (6) Can. 325,770, Sept. 6, 1932; (7) Czech. 43,378, Dec. 15, 1932; (8) Holl. 33,076, June 16, 1934.

C. MERTS FRANZHEIM

C. Merts Franzheim, president of the Charles M. Franzheim Co., Wheeling, W. Va., died on August 30, 1942, at his home in Wheeling. In ill health for some time, he had been seriously ill several weeks before his death.

The son of the late Charles W. and Lida Merts Franzheim, Mr. Franzheim was born in Wheeling on February 15, 1883, and had been a life-long resident of that city.

Receiving his preliminary schooling at Linsly Institute in Wheeling and at Laurenceville School, he also attended Ohio State University, Columbus, Ohio, and completed his studies at the University of Bunzlau, Germany, where he majored in ceramics.

He later returned to the Continent every year or two to visit clay mines and pits in an attempt to learn exactly how the material was handled from the time it was mined until it was shipped. Mr. Franzheim also attended the Josiah Wedgwood Bicentenary Celebration held in London in 1930.

Mr. Franzheim had been identified with community affairs over a period of time. Interested in civic improvement, he was chairman of the beautification program for Wheeling and Ohio County sponsored by the Ohio Valley Board of Trade. He was also keenly interested in the Oglebay Park program.

An enthusiastic member of the Little Theater of Wheeling, Mr. Franzheim had served as vice-president of this organization. He was also a director of the Fort Henry Club and a member of the Wheeling Country Club, was affiliated with the directorate of the Town Club, and was a member of the Vance Memorial Presbyterian Church.

He is survived by two sisters, Mrs. Walter H. Coursen and Mrs. Katherine Cottingham, and by two brothers, George W. and Kenneth Franzheim.

Mr. Franzheim had been a member of The American Ceramic Society for twenty-four years, becoming an associate member in 1918 and an active member in 1923.

C. Merts Franzheim

NOTES FOR CERAMISTS

MEETINGS OF SCIENTIFIC AND LEARNED SOCIETIES

Numerous inquiries are being received from the officers of scientific and learned societies with respect to the possibility or desirability of holding their annual meetings. The Science Committee (advisory to the National Resources Planning Board), which is composed of members designated by the four councils (National Research Council, American Council on Education, American Council of Learned Societies, and Social Science Research Council), has thought it desirable to issue the following statement, which has been prepared after consultation with the branches of the Federal Government most concerned. This statement should not, however, be considered an official statement on the part of any branch of the Federal Government.

In view of the fact that the present emergency calls for the greatest mobilization of scientists, scholars, and educators in the history of the United States, it is clear that the societies and associations into which they are organized have an important part in the war effort. This part includes not only direct participation by scientists, technologists, scholars, and others in war activities, but also the discussion of present and future problems and the maintenance of a vigorous intellectual life. There are no fields of knowledge which are not affected and which do not have some contribution to make.

It may safely be assumed, therefore, that the meetings of scientific, scholarly, and educational societies and associations may be so organized as to be in the public interest. These meetings should be organized in such a way, however, as not to interfere in any way with the actual prosecution of the war.

(1942)

The Science Committee suggests, therefore, that each society or association should consider the relationship which its field or discipline bears to the war effort and the contribution that it can make, and that it should plan the program of its meeting with this relation or contribution in view. It should not overlook, however, the importance of considering the postwar period nor the necessity of maintaining such activities as contribute to a strong national intellectual life.

The Science Committee points out, however, that, so far as possible, meetings should not be held in or near defense areas, especially the ports and cities of the Atlantic seaboard, and that they should be held on such days of the week as to avoid, so far as possible, week-end (Friday noon to Monday noon) travel. The suggestion is made that some of the large associations may find it advantageous to organize their annual meetings in regional gatherings rather than in a single meeting in one place. Societies and associations should also distribute their meetings among different cities to avoid congestion at any one point or along routes of travel.

The Science Committee has been requested to point out the increasing difficulty of handling civilian traffic, the difficulty in securing space and seats, the possibility of late trains and misconnections, and the importance of voluntary curtailment of nonessential travel.

It has further been suggested to the Science Committee that meetings not closely connected with the war effort should be postponed, and that attendance at all meetings should be confined to those whose presence or participation is deemed to be useful. Finally, the Science Committee wishes to point out that this statement is based upon conditions of transportation that exist at the present time, and that changes in those conditions may take place and may necessitate radical changes in plans for meetings. Organizers of meetings should accordingly be prepared promptly to make necessary changes in their plans.

—Edwin B. Wilson, *Chairman, Science Committee, National Resources Planning Board*

SOUTHERN CALIFORNIA SECTION

The Southern California Section held its first stated meeting of the year at the Clark Hotel in Los Angeles on July 24. Over sixty members and their guests attended and were entertained by sound motion pictures on defense.

We also had an opportunity to wish farewell to an old-time member and a hard worker for The Society, A. Lee Bennett, who has been transferred to the Seattle office of the Gladding, McBean & Co., where he will serve as vice-president in charge of sales in the Northwest Division.

Among those missing were B. M. Burchfiel, who is working hard at his job as a lieutenant commander in the Navy. We miss "Burch" very much, as he was usually one of the members who contributed much to the meetings. Warden W. Gaskins, who has also been inducted into the service, is serving as an ensign in the Navy.

Joe Stevens, our chairman, made a fine plea for new members for our Society, which was very timely.

—R. F. Evans, *Secretary*

KILNS FOR CRAFT POTTERS

However important they may be to culture, pottery kilns cannot claim any effective part in war production. Kilns, therefore, because they require steel and other strategic metals in their manufacture, are out "for the duration."

This should not be of too great a concern, even though the kiln is probably the most important piece of equipment in the ceramic plant or studio. Properly used and maintained, the life of a well-constructed kiln can be measured in generations. Even the best kiln improperly used and maintained can be reduced to "a machine of ugly disappointments" in but a fraction of that time.

There are some simple rules to follow in the care and maintenance of kilns to obtain properly fired ware, the lowest fuel consumption, uninterrupted production, and a long kiln life with minimum repair.

(*1*) *Do not overfire.* Crowding a kiln to temperatures well above the levels for which that kiln was built is like driving ninety miles an hour in a car built to survive sixty. One of the most reputable kiln manufacturers in America recommends his standard pottery kiln for temperatures up to cone 5 (2245°F.) and a companion china kiln for temperatures up to cone 08 (1814°F.). For heat-treatments consistently higher than those recommended this manufacturer developed a kiln with sillimanite linings which safely operates as high as cone 12 (2498°F.). If you do not know the normal "safe ceiling" for your own kiln, write to the company which made it. It will be glad to furnish this and any other information on the kiln.

(*2*) *Do not overload.* Distortion and premature cracking of floor tile are a common result of overloading. If a surplus remains over at the end of a run of normal loads, it is a temptation to add this surplus to the last charge. It is safer and cheaper in the long run to run through an extra firing, as this surplus means an overloaded kiln.

(*3*) *Be sure of good circulation.* If one or more floor supports need replacing, use correct repair parts. *Do not* use a brick or another make-shift, as this prevents proper circulation in the combustion chamber. Also, be sure that any small pieces of ware which may have dropped through the muffle-tube holes in the floor are removed. Through the peep hole provided for this purpose, observe the condition of the muffle arch when the kiln is hot.

(*4*) *Have sufficient draft.* Wise operators always provide a surplus of draft when installing their kilns. Too much draft is better than not enough, because when excess draft is available it can be held at the proper point by adjusting the damper blocks.

(*5*) *Get circulation throughout charge.* Set all ware so that heat may pass freely through it. It is a temptation to load a kiln too tightly, especially when the ware consists of small pieces rectangular in cross section.

(*6*) *Replace damaged parts.* "Wear invites wear." This is true of any machinery or equipment. "Getting by" with broken, badly cracked, or warped refractory parts in the muffle, combustion chamber, or lining of a kiln is "penny wise and pound foolish." In addition to speeding up wear and failure in adjoining members, faulty parts almost always cause poor results in the ware, owing to the entrance of combustion gases into the muffle.

(*7*) *Keep entire muffle tight.* It is a good plan occasionally to give door lining, floor, arch, and lining tile a wash coating of air-setting high-temperature cement when the kiln is cold. Muffle tubes should be tightly sealed into the floor and arch tile with a stiff mix of high-temperature cement.

(*8*) *Do not rush the firing.* Building up the temperature gradually during early stages not only saves gas, but avoids excessive strain on the ware and on kiln members.

(*9*) *Make use of the manufacturer.* The company which made your kiln has a continuing interest in its satisfactory performance, whether you bought it last month or a generation ago. Reputable manufacturers are always glad to help with your problems, and they have a wealth of experience that can be valuable to you. Use it!

POTTER'S ART STILL FLOURISHES IN QUEBEC PROVINCE

The ancient art of the potter will remain alive for many years if provincial government plans to establish a small class of "artisan farmers" are continued.

The school has been in existence for several years. Trained in the College de Beauceville, La Beauce County, the ceramists are young men whose aim is to become self-sufficient artisans, owning their own farms, cultivating the land in summer, and creating decorative pottery in winter.

The potter's art is an old one in Quebec Province. Marius Barbeau, authority on French Canadian folklore, recalls that the art flourished in Quebec seventy years ago.

The ceramists have established their headquarters, showroom, and workshop on the Levis-Jackman highway, between the villages of St. Joseph and Beauceville.

INDUSTRIAL HYGIENE FOUNDATION

The seventh annual meeting of the Industrial Hygiene Foundation will be held November 10 and 11, 1942, at Mellon Institute, Pittsburgh, Pa.

Using as their theme "Health Arms the War Workers," members of the Foundation will discuss means for reducing the approximately two and one-half million days that war workers are losing weekly from illness and nonindustrial injuries. An average of 350,000 work days are being lost daily at a time when the war production schedule calls for a plane every eight minutes and a tank every twelve minutes.

CERAMICS IN NYA: A WAR EMERGENCY*

By Alice Josephine Gitter

Abstract

The National Youth Administration for Ohio maintains a ceramic workshop at Dennison, Ohio, to train youth for various ceramic industries. The purpose of the shop, the type of work done, and a general description of the shop are given.

I. Introduction

National Youth Administration workshops were established several years ago to train youth between the ages of 18 and 25 who (1) have dropped out of school and are definitely not prepared for private employment or (2) are high school graduates who are unable to attend college and who still need additional vocational training.

The NYA, recognizing the importance of the ceramic industry in Ohio, decided to establish a shop for ceramic training. After an extensive survey, the city of Dennison was selected because of its proximity to other clay centers and because of the cooperation of the community itself. The Dennison Board of Education offered the use of a two-story brick school to house a ceramic workshop, and the local sewer-pipe manufacturers gave organized support.

The school building, abandoned in 1930, was in a sorry state. Every window was broken, all the ceiling plaster had fallen off, the basement floor was so covered with dirt that it was impossible to distinguish the concrete underneath, and the wiring and plumbing were bad. A crew of ten boys without any previous work experience began the job of rehabilitating the building, installing equipment, and setting up a small dinnerware plant.

After the necessary repairs were completed, operations were started as nearly like factory procedure as possible, so that this workshop is actually a small dinnerware plant, both in respect to its equipment and to its processes.

No product made in an NYA shop may be sold to the public. Dinnerware is produced for NYA resident centers, cafeterias, and home economic projects (see Fig. 1).

II. The Work Project

The type of dinnerware produced is, in general, a heavy semiporcelain in pastel colors made to withstand the heavy usage such as it would receive at boys' camps. About 8000 dinnerware pieces were shipped out in 1941; during March, 1942, 2000 pieces were completed for use at the Muskingum NYA Resident Center, which is now being used as a Naval Training Base. The motto, therefore, of this project which was started as a purely training program has now become "Production through training to help in the national emergency."

Fig 1.—NYA production.

The original crew of ten boys grew, girls were added, and when, during the summer of 1940, an extensive in-school program was being conducted, the shop operated 24 hours a day and reached a maximum employment of 185 youth.

The record to date is shown in the following table:

	Boys	Girls	Total
Present employment	3	30	33
Left for			
(1) Private employment	93	62	155
(2) Army	17	0	17
Returned to school	26	27	53
In other NYA workshops	13	11	24
Sickness	0	2	2
Married	0	17	17
Unknown	7	21	28
	159	170	329

More than half of the youth has left for private employment. The figures show that fewer girls go into private employment than boys, but it should be remembered that it is only within the last few months that industry has found it increasingly necessary to employ girls to replace boys.

Sufficient youth cannot be supplied to meet the demands of the near-by dinnerware and sewer-pipe plants. There is frequently insufficient time to completely train a youth in ceramics, but a serious attempt is made to increase his self-reliance and to establish good working habits.

* Presented at the Forty-Fourth Annual Meeting, The American Ceramic Society, Inc., Cincinnati, Ohio, April 23, 1942 (Art Division). Received April 23, 1942.

Early in the spring of 1940, related training classes were started under the direction of the Board of Education. At the present time, each youth spends four hours a day on NYA production, for which he is paid 26 cents per hour. Four hours per day without pay is given to related training classes, which have been designed to give a general ceramic background and added experience in making more complicated ceramic pieces (see Fig. 2). Such training cannot be given while students are maintaining production.

FIG. 2.—Classwork.

It should be emphasized that the purpose of this workshop is not to produce ceramic engineers or trained artists, but to prepare the youth for private employment in ceramic plants.

In addition to the production of dinnerware, a laboratory is maintained where a few select youth carry on routine tests and are being trained as factory laboratory assistants. Local sewer-pipe manufacturers frequently use these laboratory facilities.

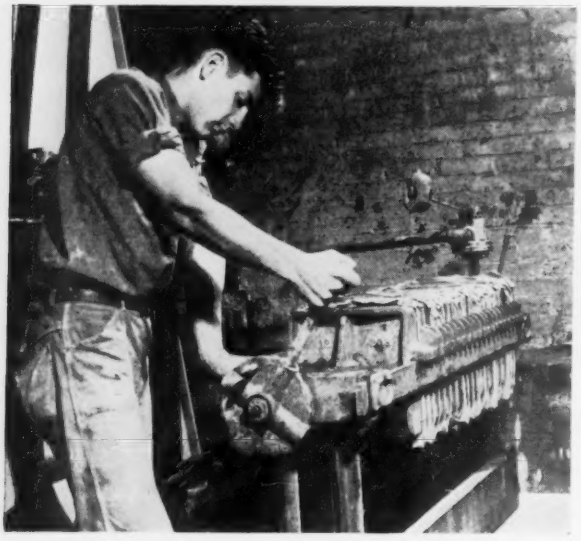


FIG. 3.—Filter press.

III. Self-Government

This shop, under the direction of a full-time NYA supervisor, is governed by the youth themselves, who have regular meetings to discuss all mutual problems, such as maintenance, production, safety, and recreation. When the employment count is high, the youth have a foreman and elect representatives to form a governing body; when the crews are small, however, they meet together in a group to formulate general shop policies.

IV. The Ceramic Shop

One room in the basement is used as a sliphouse and is equipped with a Patterson double blunger, a magnetic screen, a filter press (Fig. 3), and a vertical pug mill which will hold approximately 150 lb. of clay per day.

Storage bins for raw materials are placed in one section of the room, and a small opening from this main room is used for storing the clay from the filter press.

FIG. 4.—Mold shop.

The forming room is located on the first floor directly above the sliphouse so that at some future date a conveyer may be installed for carrying the clay to the first floor. On one side of the room is a jiggering wheel, a batting-out table, and storage spaces for jiggering molds. The casting equipment on the opposite side of the room consists of a $^1/_3$-h.p. portable mixer, 50-gallon jars, low tables, and storage racks for molds and ware. All forming and finishing is done in this room, where the green ware is dried before it is taken directly across the hall to the kiln room.

The kiln room contains two gas-fired, muffle kilns, with inside capacities of approximately 8 cu. ft. each, and one electric kiln with a capacity of approximately 2 cu. ft. All of the ware is fired twice; the kilns are fired every day on a 12-hr. cycle to cone 02. Only medium gas pressure is available; no blowers are used, and the average gas required to fire each kiln is 4000 cu. ft. per day. It is planned to install blowers to increase the efficiency of combustion.

Glazes for NYA production are prepared in 3-gallon quantities in the ball mills, whereas the small quantities used in classwork are prepared in a milk-shake mixer. Glazes are applied by dipping or spraying; a complete set of Binks spraying equipment is used for the latter.

One room on the second floor is devoted to mold making (Fig. 4), where all molds for production are made by the youth; as a general rule, however, the blocks and cases

are made by regular modelers. A 1/4-h.p. portable mixer is available for making large batches of plaster, but for most classwork the plaster is made by hand.

The laboratory is directly across from the mold shop on the second floor, and its more important equipment consists of a Hoskin's electric furnace, a Raymond pulverizer, a ball-mill rack, a gyratory screen shaker, and three small mixing units for trial bodies and glazes. The shop also contains a first-aid room, a general maintenance room, and a tool room. The main rooms, such as the forming room and the kiln room, are 30 by 35 feet and have windows on two sides so that there is always excellent lighting.

V. Conclusion

Ceramics in times of national emergency is immensely important from a technical standpoint in that there must be refractories, sewer pipe, and insulators. From a general standpoint, however, it is not only important for training youth for skilled work such as is being attempted, but it is an essential morale-building factor. Youth working with a material such as clay, that is common, earthy, and homey yet may be used to create useful as well as lovely articles, obtain training not only for present vocations but a basis on which to build an avocation in the future.

CERAMIC WORKSHOP
DENNISON, OHIO

NEW POTS FROM THE OLD CLAYS OF THE WEST *

BY GLEN LUKENS

ABSTRACT

Potters of the West Coast use low-fusing clay bodies and glazes. Talc is obtained from the eastern slopes of the High Sierra, colemanite from the desert areas, and clays from the lowlands, and natural gas is used for fuel. The search for native materials through a period of twenty years has been a major part of the ceramic effort. Ceramic teachers in high schools and universities have worked with technicians from the ceramic industries, and the result is a wide range in basic materials.

The ceramic industry of the Pacific Coast, which for twenty years or so has been doing pretty well, has taken a sudden jump in importance, especially in the southwest portion. Three reasons for this are commonly accepted, viz., (1) the steady growth of clay study in the schools of the State and the publicity gained from school ceramic exhibitions, (2) the eagerness with which large manufacturers have responded to requests for color in ceramic ware, and (3) the closing of foreign markets.

The first products of California kilns were introduced into eastern markets in 1925 and were received with great enthusiasm. Today in Los Angeles there are five major potteries, and within a radius of thirty miles of Los Angeles there are 108 smaller companies which are called "home industries." These small industries, which are more experimental and change from one thing to another, produce chiefly decorative figures and vases, bowls, cigarette boxes, and unique forms to fill the needs of thousands of persons who enjoy flower arranging.

Pottery making is perhaps the oldest craft in California, for the mission fathers in 1775 taught the Indians to make building tile and ollas (oyas) which were large water containers left unglazed to keep the water cool. Those early forms had great charm; they were strong and simple in shape, free from unnecessary pattern, and held no other claim to distinction than that they were functional and reasonably well made. More recent years have seen innovatons in forms and techniques which reflect the spirit and intention of European potters, past and present; considering everything, however, there has been a steady undercurrent of interest in maintaining in the ceramic output the traditions and modes of life of early California when that life held gracious and simple hospitality.

In 1927, one of the local firms introduced six colors into its products. There had been little wayside potters who made red terra-cotta flowerpots and unglazed Mexican-type cooking utensils. No one seems to know who could have possibly used these vast quantities of red shale ware, but still it sold readily. When those six glazes made their appearance, however, the effect was magical and revolutionary.

California colored pottery caught the public fancy. In 1932, the writer taught in summer session in an eastern university, and everyone asked him if he knew how to make the bright colors the commercial potters were producing out West on mixing bowls, vases, jardinieres, and bowls. Everyone in California loves bowls!

Clay bodies of the West are composed of talc, which comes from the Panamint and Death Valley portions of the State. When a certain tremolitic talc from California is combined with a potash clay, such as Kentucky ball clay, the mechanical bond is achieved with a low kiln temperature. Perhaps that is where the misleading descriptive phrase, "low-fusion bodies," comes in. They do not fuse at all, but they are undoubtedly tight and hard at cones 06 to 02. The problems of thermal shock have been reduced, too, because of the huge percentage of talc in the clay, for talc has scarcely any expansion or contraction.

Potters of the West Coast are using colemanite in their glazes. Colemanite, a calcium borate, was mined long ago in Death Valley, and it is the material from which the earliest borax was made. When deposits of purer material were found near the Coast, the old calcium borate mines at Ryan in Death Valley were closed. Innumerable tons of colemanite were abandoned. Recently, it has become a valuable ingredient in semialkaline glazes and makes possible the production of rare blues, yellows, and rose.

Native California clays are difficult to work. Every

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pound of native clay has to be washed and filter-pressed to remove the alkaline materials which have washed down from the slopes of the Sierras. Plastic Vitrox, also a California mineral product, will mature to a completely vitrified porcelain at cone 5; it does not overfire below cone 8. It is a complete ceramic body within itself. Its structural characteristics combine four materials: silica, alumina, calcium, and magnesia (potash 3.80).

A good body formula to start with is given as follows:

Body A (cone 1): plastic Vitrox 85, English ball clay 15, and dolomite 3; borax-lead glaze for body A (cones 01 or 02): lead carbonate 50.00, feldspar 28.75, Florida clay 3.25, whiting 11.25, zinc oxide 3.00, flint 27.75, Zircopax 15.00, and borax 30.50.

The search for ceramic materials in the West has been a major interest of the ceramic worker for many years. Teachers, students, and ceramic technicians have all taken part in this far-flung effort.

All through man's search for self-expression, his greatest achievement has come only when he has grown familiar with the media of his craft. So in the West the necessity for developing raw materials as a part of creative effort has given zest to the work. When a person works close to the raw materials of the earth, when he selects the ingredients of a clay mix, and when he studies the heating power of natural gas and helps to build his own kiln, he follows the immemorial pattern of primitive man in making all the gestures of creation, and the cheap desire to imitate some other artist's style and manner gradually gives way to more honest creative methods as he toils over the raw materials of his craft.

Ceramic art at its best is beautiful with the brave sort of beauty which is found in the shape of an elm tree, a far-off mesa on the rim of the desert, a rhododendron blossom, or in a piece of moonstone. Ceramic art can be ugly, too, with the pushing and shoving coarseness of a person determined to get his work accepted "regardless."

The marketing problem was for a long time a difficult proposition. Finally, it was discovered that the only vital difference between the home-industry potter who produced fifty pieces a week and the factory turning out ten thousand pieces was the manner in which the articles were merchandised. The problem has not yet been solved satisfactorily, but every home-industry potter who is making a good product has little difficulty in disposing of it, because buyers from eastern, northern, and central states "look the land over" twice a year. In a few instances, eastern stores have advanced the money needed to put a kiln and equipment to work for a young artist without funds.

The question has been asked, "Where did these young and middle-aged and older potters learn to do this work?" The older potters studied in the East, but the younger potters learned on the Pacific Coast, in Seattle, Portland, San Francisco, Santa Barbara, Los Angeles, San Diego. It all began about twelve years ago in the pottery and art departments of the state high schools, state colleges, and universities and in the commercial potteries which were already established at that time. In these schools, young men and women found teachers who knew how to blend the difficult clays of California, to compound glazes, to fire kilns, to operate the potter's wheel, and to produce good forms and then reproduce them from molds. When the pottery instructors had taught all this, some of the students started small studios of their own and were soon earning a living.

There are still a few schools and art supervisors who resist what they call the "commercial aspect" of a youth's training, as if he might never need to earn his bread by the sweat of his face. Most art teachers, however, are wiser and have geared their teaching to the demands of the age so that now, when a student displays promise as a producer of fine objects of use, he receives all of the encouragement from his teacher that he can take.

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- The technical activities of ceramic trade associations are closely allied with, and in several instances result from, particular activities of This Society.
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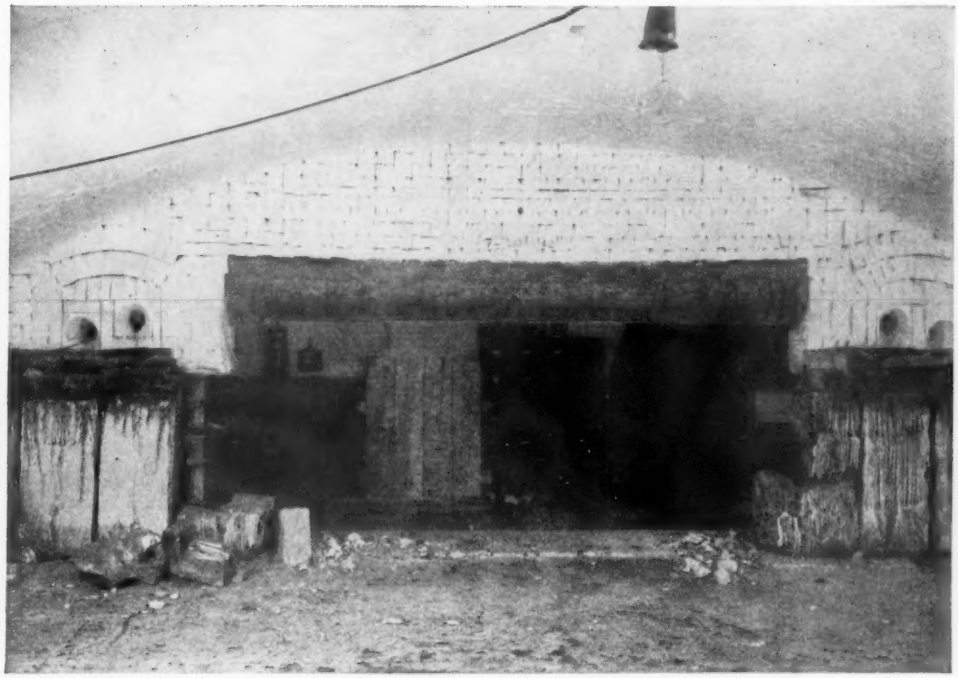

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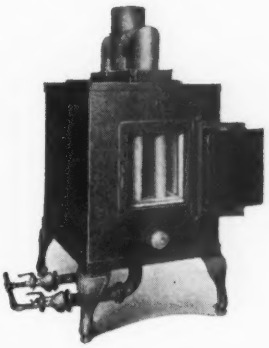

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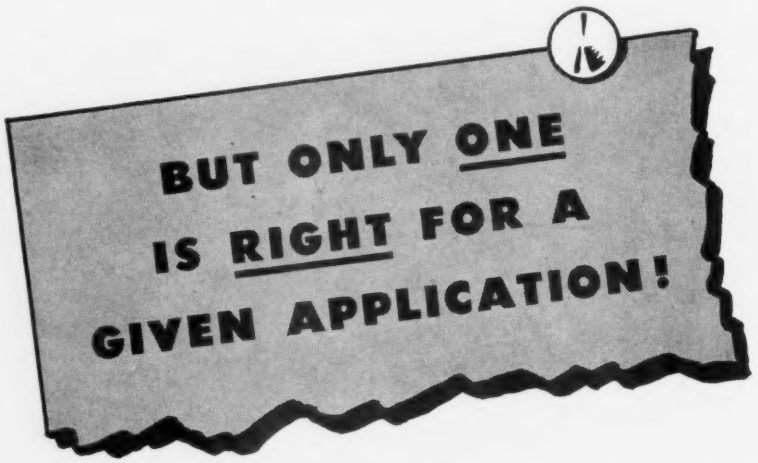

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Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

Alumina (Fused) Brick and Tile
Electro Refractories & Alloys Corp.
The Vitro Mfg. Co.

Aluminum Oxide (Calcine)
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Aluminum Oxide (Fused)
Carborundum Co.
Electro Refractories & Alloys Corp.
Foote Mineral Co.
Harshaw Chemical Co.
Norton Co.
The Vitro Mfg. Co.

Alundum (Refractory Products)
Norton Co.

Ammonium Bicarbonate
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Solvay Sales Corp.

Ammonium Bifluoride
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Ammonium Carbonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Antimony Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Antimony Sulphide
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
The Hommel, O., Co., Inc.

Arches (Interlocking, Suspending, and Circular)
Frazier-Simplex, Inc.

Arsenic
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Automatic Brick Car Loaders
Lancaster Iron Works, Inc.

Ball Mills
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.
Inc.
McDanel Refractory Porcelain Co.
The Vitro Mfg. Co.

Ball Mills (Laboratory Type)
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Barium Carbonate
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Basic Oxides
Porcelain Enamel and Mfg. Co.

Batch Systems
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.
National Engineering Co.

Batts
Carborundum Co. (*"Carbofrax Aloxite"*)
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Norton Co. (*Alundum-Crystolon*)

Beryl
Foote Mineral Co.

Bichromate of Soda
Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Binders
L. H. Butcher Co.

Bitstone
Potters Supply Co.

Blocks (Refractory)
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Louthan Mfg. Co.
Norton Co.
The Vitro Mfg. Co.

Body Stains
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., R. & H. Chemicals Dept.
The Hommel, O., Co., Inc.

Bone Ash
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Borax
American Potash & Chemical Corp.
H. L. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co. Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
The Vitro Mfg. Co.

Borax Glass
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
The Vitro Mfg. Co.

Boric Acid (Anhydrous)
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemica lCo.
The Vitro Mfg. Co.

Boric Acid (Crystal, Granular, or Powder)
American Potash & Chemical Corp.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pacific Coast Borax Co.
Stauffer Chemical Co.
The Vitro Mfg. Co.

Boron Carbide
Norton Co.

Brick Machines (also Barrows, Molds)
Lancaster Iron Works, Inc.

Brick (Refractory)
L. H. Butcher Co.
Carborundum Co. (*"Carbofrax Aloxite"*)
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Norton Co.
Charles Taylor Sons Co.
The Vitro Mfg. Co.

Cadmium Sulphide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Carbofrax (Refractory Products)
Carborundum Co.

Carbonates (Barium, Lead)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Castings
Lancaster Iron Works, Inc.

Caustic Potash
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Solvay Sales Corp.

Caustic Soda
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
Stauffer Chemical Co.
The Vitro Mfg. Co.

Cements
L. H. Butcher Co.
Carborundum Co.
Corhart Refractories Co.
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Norton Co.
Pennsylvania Salt Mfg. Co.
Charles Taylor Sons Co.

Ceramic Chemicals
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Cerium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Foote Mineral Co.

Chromite (Natural Chromate of Iron)
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.

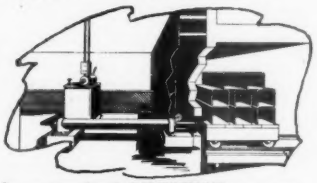
Chromium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Clay (Ball)
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Paper Makers Importing Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
United Clay Mines Corp.
The Vitro Mfg. Co.

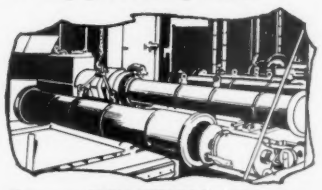
Clay (Bentonite)
American Colloid Co.
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.

THE CERAMIC INDUSTRY'S NEW RIGHT HAND

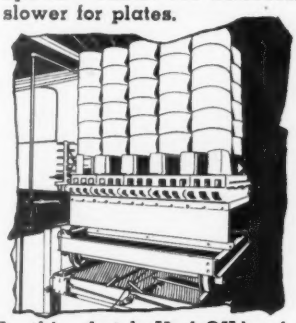
The Ceramic Industry is swinging more and more to HydrOILics for the answers to its movement-control and production problems. It is viewing HydrOILics in its real light — as a new right hand that packs higher efficiency of power, speed, and control into a wide range of operations. Ceramic production men are realizing more fully the *basic* advantages HydrOILics obtains in using *oil* as a medium for transmitting power and motion.



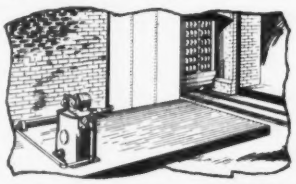
In a typical PUSHING operation as shown above, HydrOILics eases ponderous, ware-loaded cars through tunnel kilns at split-second constancy of speed regardless of variations in the load. Yet the speed of these car-pushers can be varied infinitely, to meet the exact requirements of any processing need.



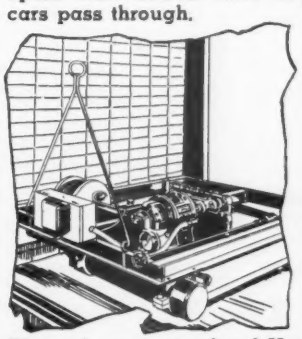
On an EXTRUDING job, pictured above, HydrOILics forces mixed clay under tremendous pressures through steel cylinders and into automatic machines that form dishes at high speeds. HydrOILics feeds the clay into the machines at any required speed — faster for saucers, slower for plates.



In this sketch HydrOILics is handling a LIFTING operation. It is a HydrOILic elevator that raises and lowers kiln cars automatically at constant speed, so that placers always work at near-shoulder height. They work faster with less fatigue, are relieved of a lot of hand transferring of loaded cars, and are able to reduce breakage sharply.



A good example of PULLING is a hydraulic door in a tunnel kiln operated by a HydrOILic cylinder interlocked with the propeller that pushes the cars through the kiln. As the cars approach the entrance, the door is automatically pulled open, then closed after the cars pass through.



Above is an example of HydrOILic POSITIONING — A unit designed for packing bricks into box cars tightly enough to prevent breakage in transit. The unit is rolled into the loaded car, and plungers are forced against the bricks in one end. The cargo packer, being portable, exerts equal pressure on the bricks in both ends of the car.

HydrOILics does jobs like these better because it delivers more *flexible* power, speed and control. Find out how it can improve your own production. Of course, HydrOILic production is heavily taxed now in meeting vital war needs, but you can get a head start on your needs for tomorrow. Write, or call your Denison representative. The Denison Engineering Company, 1161 Dublin Road, Columbus, Ohio.

WHEREVER YOU NEED POWER-SPEED-CONTROL

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Clay (Block)
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Clay (China)
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Ceramic Color & Chemical Mfg. Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Thomas Alabama Kaolin Co.
The Vitro Mfg. Co.

Clay—Cleaners, Feeders
Lancaster Iron Works, Inc.

Clay (Electrical, Porcelain)
Hammill & Gillespie, Inc.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Clay (Enamel)
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Metal & Thermit Corp.
Porcelain Enamel and Mfg. Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Clay (Fire)
L. H. Butcher Co.
Denver Fire Clay Co.
Great Lakes Foundry Sand Co.
Green, A. P., Fire Brick Co.
Maxson, Elwyn L.
Potters Supply Co.
Charles Taylor Sons Co.
Thomas Alabama Kaolin Co.

Clay (German Vallendar)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc.,
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Clay (Micronized)
L. H. Butcher Co.
Porcelain Enamel and Mfg. Co.

Clay Miners
American Colloid Co.
Great Lakes Foundry Sand Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Clay (Potters)
Denver Fire Clay Co.
Hammill & Gillespie, Inc.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

(Process Equipment)
Lancaster Iron Works, Inc.
National Engineering Co.

Clay (Sagger)
L. H. Butcher Co.
Great Lakes Foundry Sand Co.
The Hommel, O., Co., Inc.
Kentucky Clay Mining Co.
Maxson Elwyn L.
Potters Supply Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Clay-Slip (Albany)
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Hammill & Gillespie, Inc.

Clay (Wad)
L. H. Butcher Co.
Kentucky Clay Mining Co.
Potters Supply Co.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Clay (Wall Tile)
Hammill & Gillespie, Inc.
Kentucky Clay Mining Co.
Maxson, Elwyn L.
Spinks, H. C., Clay Co.
Thomas Alabama Kaolin Co.

Cleaners
L. H. Butcher Co.
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.

Cleaners, Chemical
Harshaw Chemical Co.
Pennsylvania Salt Mfg. Co.

Clocks (Gauge Board)
The Hommel, O., Co., Inc.

CO_2 Recorders
Hays Corp.

Cobalt Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Cobalt Sulphate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Colors
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Combustion Control
Hays Corp.

Combustion Meters (CO_2 Recorders)
Hays Corp.

Cone Plaques
Industrial Ceramic Products, Inc.

Cones
The Edward Orton, Jr., Ceramic Foundation

Control—Firing System
Forester Firing System

Controllers—Gas-Air Ratio
Hays Corp.

Controllers—Oil-Air Ratio
Hays Corp.

Controllers—Automatic Tank Pressure
Hays Corp.

Conveying Equipment
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.
National Engineering Co.

Copper Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Corhart
Corhart Refractories Co.

Cornwall Stone (Imported)
L. H. Butcher Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.

Crucibles (Filter, Melting, Ignition)
L. H. Butcher Co.
Carborundum Co.
Denver Fire Clay Co.
Norton Co.
Potters Supply Co.
Charles Taylor Sons Co.

Crushers (Clay)
Lancaster Iron Works, Inc.

Cryolite (see Kryolith)
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
The Vitro Mfg. Co.

Crystolon (Refractory Products)
Norton Co.

Cullet, Washing Plants, Incinerators, Crushers
Frazier-Simplex, Inc.

Cutters (Bar)
Industrial Ceramic Products, Inc.

Decorating Supplies
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Disintegrators
Lancaster Iron Works, Inc.
National Engineering Co.

Draft Gages, Recording-Indicating
Hays Corp.

Dryer (Pipe Rack)
Lancaster Iron Works, Inc.

Drying Machinery
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.
Proctor & Schwartz, Inc.

Electrocast Refractories
Corhart Refractories Co.

Enamelers' Borax
Ceramic Color & Chemical Mfg. Co.
Porcelain Enamel and Mfg. Co.

Enameling Equipment (Complete)
Frazier-Simplex, Inc.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Enameling Furnaces
L. H. Butcher Co.
Carborundum Co.
The Hommel, O., Co., Inc.
Lancaster Iron Works, Inc.
Norton Co.

Enameling Iron (Sheet)
American Rolling Mill Co.

Enameling Muffles
Carborundum Co. (*Carbofrax*)
Frazier-Simplex, Inc.
Norton Co. (*Alundum*)

Enameling (Practical Service)
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Enamels
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Enamel Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

Enamels (Porcelain)
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

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Ceramic Color & Chemical Mfg. Co.
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Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Filter Fabrics
Metakloth Company

Fire Brick
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Charles Taylor Sons Co.
Norton Co.

Fire Brick—Process Equipment
Lancaster Iron Works, Inc.

Fire Clay
Denver Fire Clay Co.
Great Lakes Foundry Sand Co.
Spinks, H. C., Clay Co.
Charles Taylor Sons Co.
Thomas Alabama Kaolin Co.

Firing Control System
Forester Firing System

Flint
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Great Lakes Foundry Sand Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Porcelain Enamel and Mfg. Co.

Flint Pebbles
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Floors (Non-Slip)
Norton Co.

Fluorspar
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

French Flint
Maxson, Elwyn L.

Frit
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Frosting Mixtures
L. H. Butcher Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Fuel Oil Systems and Control, Stokers
Frazier-Simplex, Inc.

Furnaces
Carborundum Co. (*Carboradiant*)
Denver Fire Clay Co.
Frazier-Simplex, Inc.
The Hommel, O., Co., Inc.
Swindell-Dressler Corp.

Furnaces, Enameling
Swindell-Dressler Corp.

Gages, Draft (Recording, Indicating)
Hays Corp.

Gages, Pressure
Hays Corp.

Gages, Flow (Air and Gas)
Hays Corp.

Gages, Ratio (Flows)
Hays Corp.

Glass Bending Ovens, Glass Decorating Machines
L. H. Butcher Co.
Frazier-Simplex, Inc.

Glass Equipment
Lancaster Iron Works, Inc.

Glass Melting Tanks and Furnaces
Frazier-Simplex, Inc.

Glass Sand
Great Lakes Foundry Sand Co.

Glass Thickness Gauge
Bausch & Lomb Optical Co.

Glaze and Body Spar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Glazes and Enamels
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Glaze Spar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.

Goggles
The Hommel, O., Co., Inc.

Gold
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Gold Decorations
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.

Granulators
Lancaster Iron Works, Inc.

Grinding Wheels
Carborundum Co. (*Carborundum and Aloxite*)
Electro Refractories & Alloys Corp.
Norton Co. (*Alundum-Crystolon*)

Hearths
Carborundum Co. (*Carbofrax* heat treating)
Corhart Refractories Co.
Norton Co. (*Crystolon*)
Charles Taylor Sons Co.

Hearths (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Norton Co.

Hydrofluoric Acid
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Ilmenite
Orefraction, Inc.

Iron Chromite
Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.

Iron (Enameling)
American Rolling Mill Co.

Iron Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
The Vitro Mfg. Co.

Kaolin
Ceramic Color & Chemical Mfg. Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
Thomas Alabama Kaolin Co.
The Vitro Mfg. Co.

Kilns, China (Decorating)
L. H. Butcher Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Frazier-Simplex, Inc.
The Hommel, O., Co., Inc.
Swindell-Dressler Corp.

Kilns (Electric, Circular, Tunnel)
Swindell-Dressler Corp.

Kiln Furniture (Silicon Carbide, Semi-Silicon Carbide) (Refractory)
L. H. Butcher Co.
Carborundum Co.
Electro Refractories & Alloys Corp.
Louthan Mfg. Co.
Charles Taylor Sons Co.

Kryolith (see Cryolite)
Pennsylvania Salt Mfg. Co.

Laboratory Ware
Norton Co.

Lehr Tile (High Aluminous Clay, Electrically Sintered Aluminum Oxide, Silicon Carbide)
Carborundum Co.
Electro Refractories & Alloys Corp.

Lehrs
Frazier-Simplex, Inc.
Swindell-Dressler Corp.

Lehrs (Electric or Fuel Heated)
Frazier-Simplex, Inc.
Swindell-Dressler Corp.

Lehr Loaders
Frazier-Simplex, Inc.

Linings (Furnace Refractory, Block Refractory Plate, Brick, and Tile)
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Norton Co.
Charles Taylor Sons Co.
The Vitro Mfg. Co.

Lithium Carbonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Foote Mineral Co.

Lithium Minerals
Foote Mineral Co.

Loaders (Bucket)
National Engineering Co.

Magnesia (Fused)
Electro Refractories & Alloys Corp.
Norton Co.

Magnesia (Sintered, Calcined)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.

Magnesite
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Magnesite Calcined
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
The Hommel, O., Co., Inc.

Magnesium Carbonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Manganese
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

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Corhart Refractories Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Masks (Breathing)
Drakenfeld, B. F., & Co.

Metals (Porcelain Enameling)
American Rolling Mill Co.

Micronized Products
Porcelain Enamel and Mfg. Co.

Microscopes (Polarizing)
Bausch & Lomb Optical Co.

Microscopes (Stereoscopic)
Bausch & Lomb Optical Co.

Minerals
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Orefraction, Inc.
The Vitro Mfg. Co.

Mixers
National Engineering Co.

Mixers (Batch)
Lancaster Iron Works, Inc.
National Engineering Co.

Mixers (Concrete, Paving, Road Paving, Plaster, Asphalt, Truck, Mortar, Bituminous)
Lancaster Iron Works, Inc.

Mixers (Laboratory)
Lancaster Iron Works, Inc.
National Engineering Co.

Mold Sanders
Lancaster Iron Works, Inc.

Muffles (Furnace) (Laboratory)
L. H. Butcher Co.
Carborundum Co. (*Carbofrax*)
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Frazier-Simplex, Inc.
Norton Co.

Mullers (Batch)
Lancaster Iron Works, Inc.
National Engineering Co.

Muriatic Acid
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.

Needle Antimony
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Nepheline Syenite
Great Lakes Foundry Sand Co.

Nickel Salts
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Nitrates (Cobalt, Sodium)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc. Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Nitre
Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Norbide (Norton Boron Carbide)
Norton Co.

Olivine
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

Opacifiers
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc. Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc
Metal & Thermit Corp.
Pennsylvania Salt Mfg. Co.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Overglaze Colors
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.

Oxides
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Palladium Decorations
Du Pont de Nemours, E. I., & Co., Inc. Electrochemicals Dept.
The Hommel, O., Co., Inc.

Pins
L. H. Butcher Co.
The Hommel, O., Co., Inc.
Industrial Ceramic Products, Inc.
Louthan Mfg. Co.
Potters Supply Co.

Pins (Tile Setter)
Louthan Mfg. Co.

Placing Sand
L. H. Butcher Co.
Great Lakes Foundry Sand Co.

Platinum Decorations
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.

Polariscopes
Bausch & Lomb Optical Co.
Frazier-Simplex, Inc.

Porcelain Enameling Service (Practical)
American Rolling Mill Co.
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours. E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Porcelain Enamels
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Potters Wheels
L. H. Butcher Co.
Denver Fire Clay Co.

Potash (Carbonate)
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Solvay Sales Corp.
The Vitro Mfg. Co.

Pressure Gages, Tank
Hays Corp.

Producer Glass Plants
Frazier-Simplex, Inc.

Pug Mills
Lancaster Iron Works, Inc.

Pyrites (Natural Iron Sulphide)
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
The Hommel, O., Co., Inc.

Pyrometer Tubes
L. H. Butcher Co.
Carborundum Co.

Pyrometer Tubes (Refractory and Hard Porcelain)
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
McDanel Refractory Porcelain Co.
Norton Co.
Charles Taylor Sons Co.

Pyrometers (Optical, Radiation, Surface, Immersion, Needle)
L. H. Butcher Co.
Leeds & Northrup Co.
Pyrometer Instrument Co.

Pyrometric Cones
L. H. Butcher Co.
The Edward Orton, Jr., Ceramic Foundation

Racks, Firing (Refractory)
Louthan Mfg. Co.

Raw Material Handling Equipment
Frazier-Simplex, Inc.
Lancaster Iron Works, Inc.

Recorders, CO_2
Hays Corp.

Recorders, Draft
Hays Corp.

Recorders, Tank Pressure
Hays Corp.

Refractometers
Bausch & Lomb Optical Co.
Electro Refractories & Alloys Corp.

Refractories
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Louthan Mfg. Co.
Norton Co.
Charles Taylor Sons Co.

Refractory Materials
Carborundum Co.
Corhart Refractories Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Green, A. P., Fire Brick Co.
Louthan Mfg. Co.
Norton Co.
Charles Taylor Sons Co.
Thomas Alabama Kaolin Co.
Titanium Alloy & Mfg. Co.

Respirators
Drakenfeld, B. F., & Co.
The Hommel, O., Co., Inc.

Rutile
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours. E. I. & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
The Vitro Mfg. Co.

Saggers
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.
Potters Supply Co.

Salt Cake
American Potash & Chemical Corp.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.

Sandblast Sand
Great Lakes Foundry Sand Co.

Sand Grinder and Sifters
Lancaster Iron Works, Inc.

Saponin
L. H. Butcher Co.
The Hommel, O., Co., Inc.

Screening and Magnetic Separators
National Engineering Co.

Selenite of Sodium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Selenium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Setters (Tableware)
Louthan Mfg. Co.

Sheets (Enameling Iron)
American Rolling Mill Co.

Silica (Fused)
L. H. Butcher Co.
Electro Refractories & Alloys Corp.
Foote Mineral Co.
The Hommel, O., Co., Inc.

Silicate of Soda
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Silicon Carbide
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Silicon Carbide Firesand
Carborundum Co.

Sillimanite Refractories
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
Charles Taylor Sons Co.

Slabs (Furnace)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Soda Ash
American Potash & Chemical Corp.
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
The Vitro Mfg. Co.

Sodium Antimonate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Sodium Fluoride
Ceramic Color & Chemical Mfg. Co.
Denver Fire Clay Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Sodium Metasilicate
Harshaw Chemical Co.

Sodium Nitrite
Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Sodium Silica Fluoride
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Sodium Uranate
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Soot Blowers
Frazier-Simplex, Inc.

Special Machines
Frazier-Simplex, Inc.

Spar
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Maxson, Elwyn L.
The Vitro Mfg. Co.

Spray Booths
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.

Spraying Equipment
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.

Spurs
Louthan Mfg. Co.
Potters Supply Co.

Stacks
Lancaster Iron Works, Inc.

Steel Plate Construction
Lancaster Iron Works, Inc.

Stilts
The Hommel, O., Co., Inc.
Industrial Ceramic Products, Inc.
Louthan Mfg. Co.
Potters Supply Co.

Sulfur
Ceramic Color & Chemical Mfg. Co.
Stauffer Chemical Co.

Sulfuric Acid
Denver Fire Clay Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Pennsylvania Salt Mfg. Co.
Stauffer Chemical Co.

Talc
L. H. Butcher Co.
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
International Pulp Company

Tank Pressure Controllers
Hays Corp.

Tanks
L. H. Butcher Co.
Frazier-Simplex, Inc.

Tank Blocks
Corhart Refractories Co.

Tanks (Pickle)
The Hommel, O., Co., Inc.

Tanks for Raw Material Steel or Concrete
Lancaster Iron Works, Inc.

Tile (Floor)
Norton Co.

Tile (Muffle)
Carborundum Co.
Electro Refractories & Alloys Corp.
Norton Co.

Tile Setter Pins
Louthan Mfg. Co.

Tile (Refractory)
Carborundum Co. (*Carbofrax*)
Denver Fire Clay Co.
Electro Refractories & Alloys Corp
Green, A. P., Fire Brick Co.
Norton Co.
Charles Taylor Sons Co.
Thomas Alabama Kaolin Co.

Tile (Wall)
Denver Fire Clay Co.
Green, A. P., Fire Brick Co.
Thomas Alabama Kaolin Co.

Tin Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
The Vitro Mfg. Co.

Titanium
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Titanium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Titanium Alloy Mfg. Co.
The Vitro Mfg. Co.

Trisodium Phosphate
Ceramic Color & Chemical Mfg. Co.
Harshaw Chemical Co.

Trucks
Lancaster Iron Works, Inc.

Tubes (Insulating)
Carborundum Co.
Louthan Mfg. Co.
McDanel Refractory Porcelain Co.
Norton Co.

Tubes (Pyrometer)
Carborundum Co.
Denver Fire Clay Co.
Electro Refractories & Alloys Corp.
McDanel Refractory Porcelain Co.
Norton Co.
Charles Taylor Sons Co.

Uranium Oxide
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.

Uranium Oxide (Yellow-Orange-Black)
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Water Softening Plants
Frazier-Simplex, Inc.

Wet Enamel
Ceramic Color & Chemical Mfg. Co.
The Hommel, O., Co., Inc.
Porcelain Enamel and Mfg. Co.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Whiting
Ceramic Color & Chemical Mfg. Co.
Drakenfeld, B. F., & Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Hammill & Gillespie, Inc.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Winding Drums
Lancaster Iron Works, Inc.

Zinc Oxide
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
The Vitro Mfg. Co.

Zircon
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
The Hommel, O., Co., Inc.

Zirconia
Ceramic Color & Chemical Mfg. Co.
Du Pont de Nemours, E. I., & Co., Inc., Electrochemicals Dept.
Foote Mineral Co.
Harshaw Chemical Co.
The Hommel, O., Co., Inc.
Metal & Thermit Corp.
Orefraction, Inc.
Titanium Alloy & Mfg. Co.
The Vitro Mfg. Co.

Zirconium Oxide
Ceramic Color & Chemical Mfg. Co.
Foote Mineral Co.
The Hommel, O., Co., Inc.
Titanium Alloy Mfg. Co.

Zirkite (Natural ZrO_2)
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Acid, Boric
Acid, Chromic
Acid, Citric
Acid, Formic
Acid, Fluoboric
Acid, Hydrochloric
Acid, Hydrofluoric
Acid, Hydrofluosilicic
Acid, Naphthenic
Acid, Nitric
Acid, Oxalic
Acid, Phosphoric
Acid, Stearic
Acid, Sulphuric
Acid, Tartaric
Alcohols
Aluminum Oxide, Activated
Ammonium Bifluoride
Ammonium Molybdate
Anodes for Electroplating
Antimony Oxide
Barium Fluoride
Boron Trifluoride
Cadmium Carbonate
Cadmium Chloride
Cadmium Lithopones
Cadmium Nitrate
Cadmium Oxide
Cadmium Sulphate
Calcium Antimonate
Ceramic Colors
Chromium Acetate
Chromium Carbonate
Chromium Chloride
Chromium Fluoride
Chromium Nitrate
Cobalt Acetate
Cobalt Carbonate
Cobalt Chloride
Cobalt Hydrate
Cobalt Nitrate
Cobalt Phosphate
Cobalt Sulphate
Copper Carbonate
Copper Chloride
Copper Cyanide
Copper Formate
Copper Nitrate
Copper Oxide
Dextrine
Frosting Mixtures, Glass
Formaldehyde
Galvanizing Salts
Gold Salts
Glycerine
Gums
Heat Treating Salts
Hydrogen Chloride, Anhydrous
Hydrogen Fluoride, Anhydrous
Lead Fluoborate
Lime
Magnesium Chloride
Magnesium Fluoride
Magnesium Nitrate
Manganese Acetate
Manganese Carbonate
Manganese Chloride
Manganese Hydrate
Manganese Nitrate
Manganese Sulphate
Mercury
Metallic Soaps
Nickel Acetate
Nickel Carbonate
Nickel Chloride
Nickel Fluoride
Nickel Formate
Nickel Nitrate
Nickel Oxide
Nickel Sulphate
Oils
Pigments
Potassium Bifluoride
Potassium Fluoborate
Potassium Fluoride
Potassium Permanganate
Potassium Silicate
Reagent Chemicals
Selenious Dioxide
Silver Carbonate
Silver Chloride
Silver Cyanide
Silver Nitrate
Silver Oxide
Soda Ash
Soda Caustic
Sodium Bichromate
Sodium Bifluoride
Sodium Chlorate
Sodium Cyanide
Sodium Fluoborate
Sodium Fluoride
Sodium Nitrate
Sodium Phosphate (Mono, Di and Tri)
Sodium Silicate
Sodium Silico Fluoride
Strontium Chromate
Tin Oxide
Tin Powder
Waxes
Zinc Acetate
Zinc Carbonate
Zinc Chromate
Zinc Fluoride
Zinc Nitrate

WHAT IS YOUR BUSINESS TODAY?

CERAMICS? SHELLS? BOMBS? HEAT TREATING?

So many of the ceramic plants we contact are converting or have begun war production work—that we feel we should acquaint them with the Harshaw products other than ceramics. If you are doing work in new fields or are planning to change over, consult the guide below for materials you may need—it, of course, is not complete but will give you a general idea of the scope of our production. For any requirements of a chemical nature not listed or grouped, call on us and we will do our best to supply you or give you whatever information is available.

ACIDS

Industrial acids are available to industry from stock at our various warehouses throughout the country—acetic, boric, chromic, citric, fluoboric, formic, hydrofluoric, hydrofluosilicic, muriatic, naphthenic, nitric, oxalic, phosphoric, stearic, sulphuric, tartaric and others.

METAL SALTS AND OXIDES

The metal salts and oxides produced by Harshaw find wide application in industry—in ceramics, foods, insecticides, laboratories, leather tanning, metal casting, fabrication, plating and heat treating, in paints and varnishes, plant maintenance, paper manufacture, pharmaceuticals, pyrotechnics, rubber and textiles.

METAL ORGANIC CHEMICALS

Compounds of metals and organic carboxylic acids—widely used in industry as driers and catalysts, as preservatives and detergents, as ingredients in lubricants, plasticizers, adhesives, sizes and waterproofers. Harshaw makes a complete line including acetates, laurates, linoleates, linoresinates, naphthenates, oleates, resinates, soyates, stearates and tungates of such metals as aluminum, ammonia, barium, calcium, cerium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, tin and zinc.

GASES

Anhydrous Hydrofluoric Acid, Boron Trifluoride, Anhydrous Hydrogen Chloride—new tools for the research worker and for industry. The possibilities of these three gases are unlimited. Their unique chemical and physical properties point the way for developments in many industrial fields.

METALS

Harshaw produces exceptionally pure Mercury and Antimony metals and Tin powder. The high quality of these materials makes them ideal for chemical processing and metallurgical work.

PLATING SUPPLIES

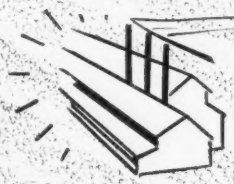
For over 40 years Harshaw has produced anodes and salts for electroplating The line includes materials for plating Nickel, Copper, Chromium, Cadmium, Tin, Lead, Zinc, Brass, Bronze, Gold and Silver. On problems of plating or the refining and winning of metals through electrodeposition, contact Harshaw for processing materials. Our Technical Staff stands ready to help you.

LABORATORY CHEMICALS AND APPARATUS

Many of the commercial chemicals produced in the Harshaw plants are further refined to obtain C.P. quality and U.S.P. quality. These materials form a part of the complete line of C.P., Reagent and Technical Chemicals distributed by Harshaw Scientific, a division of The Harshaw Chemical Company. Harshaw Scientific also carries stocks of laboratory apparatus in Cleveland, Cincinnati and Detroit.

Simpson INTENSIVE Mixers

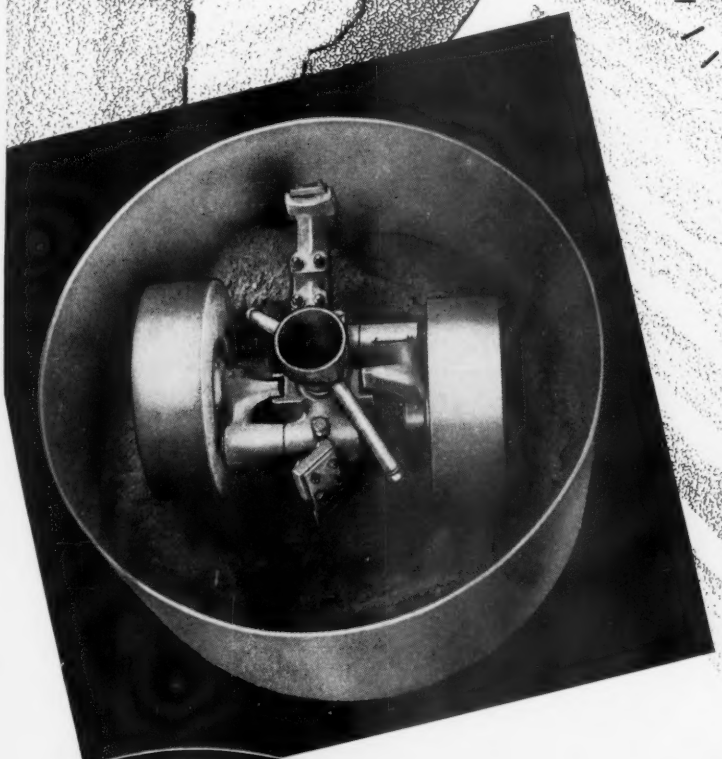
HELP OUR Good Neighbor GET INTO WAR PRODUCTION



BRAZIL'S expanding steel industry called for more and better refractories and high temperature cements — Ceramica Sao Caetana of Sao Paulo is meeting those demands through the help of a Simpson Intensive Mixer with two more on the way. This Brazilian manufacturer has taken a tip from North American industry in applying the Simpson Mulling principle of mixing to meet demands for higher quality and greater production and economy in all types of ceramic products.

For many reasons Simpson "Controlled Mixing" is the ideal method for preparing ceramic bodies. Close control assures positive results—each mixed batch is sure to be the same—exactly to specifications. Finished products in greater quantities are more uniform, stronger, are generally superior and cost less.

Write for full details on how Simpson "Controlled Mixing" with the mulling principle can help you improve your ceramic products.



• ***Shown at the left is a Simpson No. 2 Mixer applying the mulling principle to a batch of dry materials.***

SIMPSON INTENSIVE MIXERS

NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries:—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

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POSITION WANTED

Graduate Ceramic Engineer desires a position in research or production. Fourteen years' experience in clay mining, tile and glaze production, research and production on refractories. Address Box 213F, The American Ceramic Society, 2525 North High St., Columbus, Ohio.

JOURNAL OF THE SOCIETY OF GLASS TECHNOLOGY

A bimonthly Journal containing the original papers communicated to the Society together with abstracts of other papers covering the whole field of glass technology.

Membership of the Society is open to all persons, or associations of persons, interested in glass.

Orders and enquiries should be addressed to—

The Secretary,
Society of Glass Technology,
The University,
"Elmfield," Northumberland Road,
SHEFFIELD 10, England.

H. C. SPINKS CLAY COMPANY

Miners and Shippers of

BALL, SAGGER AND WAD CLAY

NEWPORT, KY.

October 1, 1942

Mr. Pete Potter
Comfortable Sanitary Pottery Mfg. Co.
Pottsville, U. S. A.

Dear Pete:

The other day at Louisville I saw the University of Kentucky boys hold that great "Georgia Cracker" from Youngstown, Ohio, Frankie Sinkwich, and his pals, to a 7 to 6 score. Sinkwich is really good, but the Kentucky boys were better organized and they wanted more to win and nearly beat Georgia—a better team built mainly on one man.

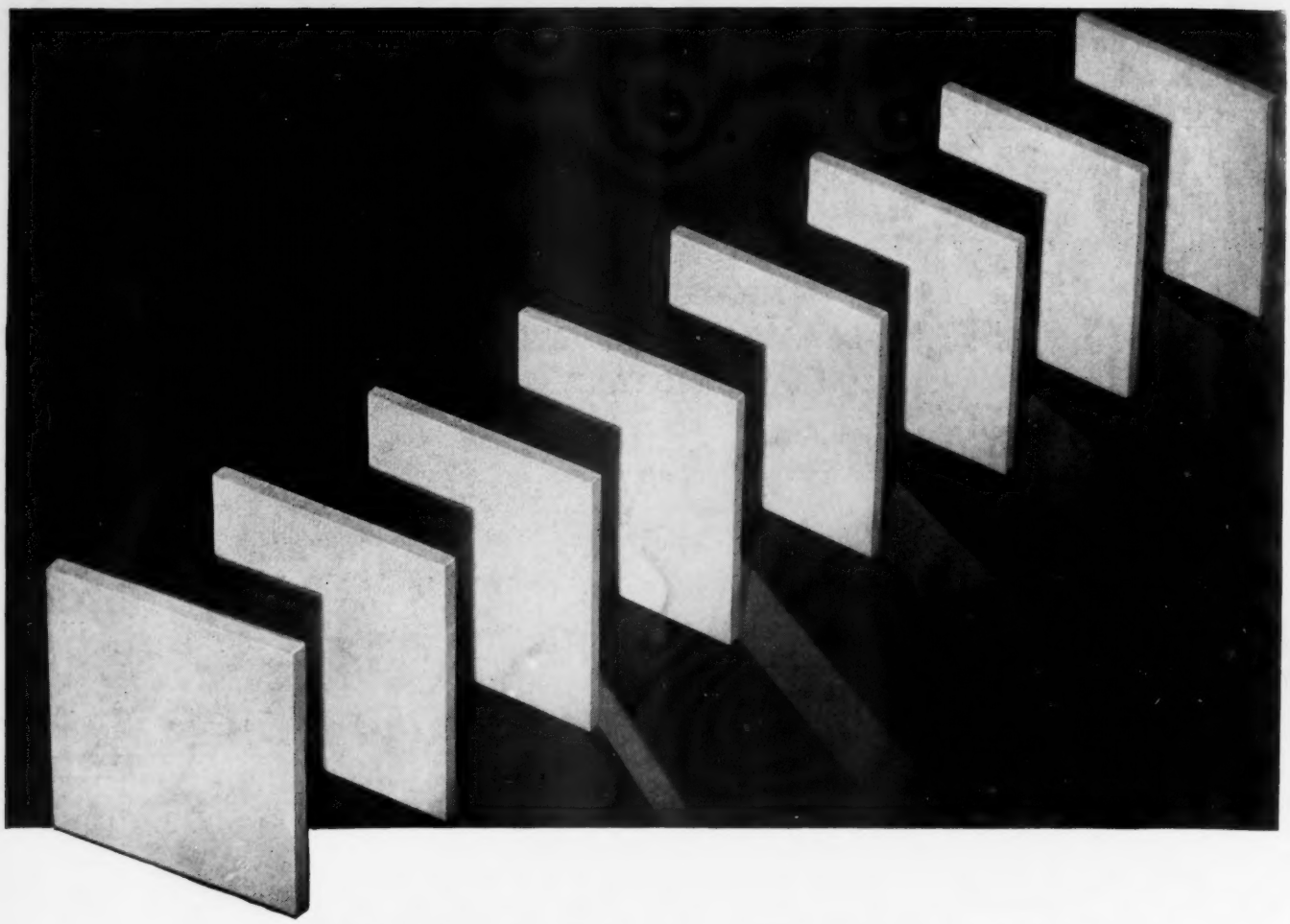
The Spinks Clay Company is not a one-man outfit. We have an organization that though small is, we think, strong in every position and definitely determined to supply you with THE BEST QUALITY BALL CLAY.

Sincerely,

Dick Carothers

General Manager
H. C. SPINKS CLAY COMPANY

RBC:MLN



UNIFORMITY...

Uniformity in the production of glazes and porcelain enamels can sometimes be a baffling problem.

Our ceramic laboratory exists to help manufacturers find the solution—whether the cause be the right combination of ingredients or batch procedure.

The use of M & T Tin Oxide or Sodium Antimonate plays a large part in assuring not only uniformity—but a high degree of opacity, tensile strength, reflectance, surface hardness, and resistance to acid and alkali stains, as well.

Manufacturers' inquiries on any phase of porcelain enamel or glaze production will receive prompt attention.

TIN OXIDE

&

SODIUM ANTIMONATE

METAL & THERMIT CORPORATION

Ceramic Division

120 BROADWAY NEW YORK, N. Y.